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Handling Supplies and Manufactured Parts

How Machine Standards Were Developed by Sulzer Brothers, Winterthur, Switzerland—Widely Adaptable Storage Shelving—Keeping a Continuous Inventory

Some valuable suggestions on the operation of machine shops and foundries, particularly as regards the handling and storage of materials for manufacture and for parts in process of manufacture, are obtained from the practice of Sulzer Brothers, in their large works at Winterthur,

the methods employed in connection with the reception and storage of supplies and machine parts. A feature of the system is the development of a standardized form of shelving and bins, which are not alone housed in a several storied large warehouse for the supplies, but are erected



The Typical Arrangement on Each Floor is a Central Track for Conveying Large Quantities or Heavy Articles to the Point Opposite the Proper Shelf. The Shelving is Made up of Steel Pipe Posts Resting on Blank Flange Feet, with Angle Iron Clamps Fixed at the Desired Heights for the Wood Shelving Proper. When Necessary Wood Plank Ends are Fastened by Straps to the Posts, as Indicated

Switzerland. These works, which employ 4100 operatives and about 700 others classed as officials, were visited at the termination of the trip through industrial Germany undertaken by the American Society of Mechanical Engineers this summer. While there was much of interest in the Winterthur works which might be studied with profit on account of its application to plants in this country, it was necessary to pay especial attention to one feature only, owing to the lack of time, and accordingly in the following it is proposed to take up the main features of

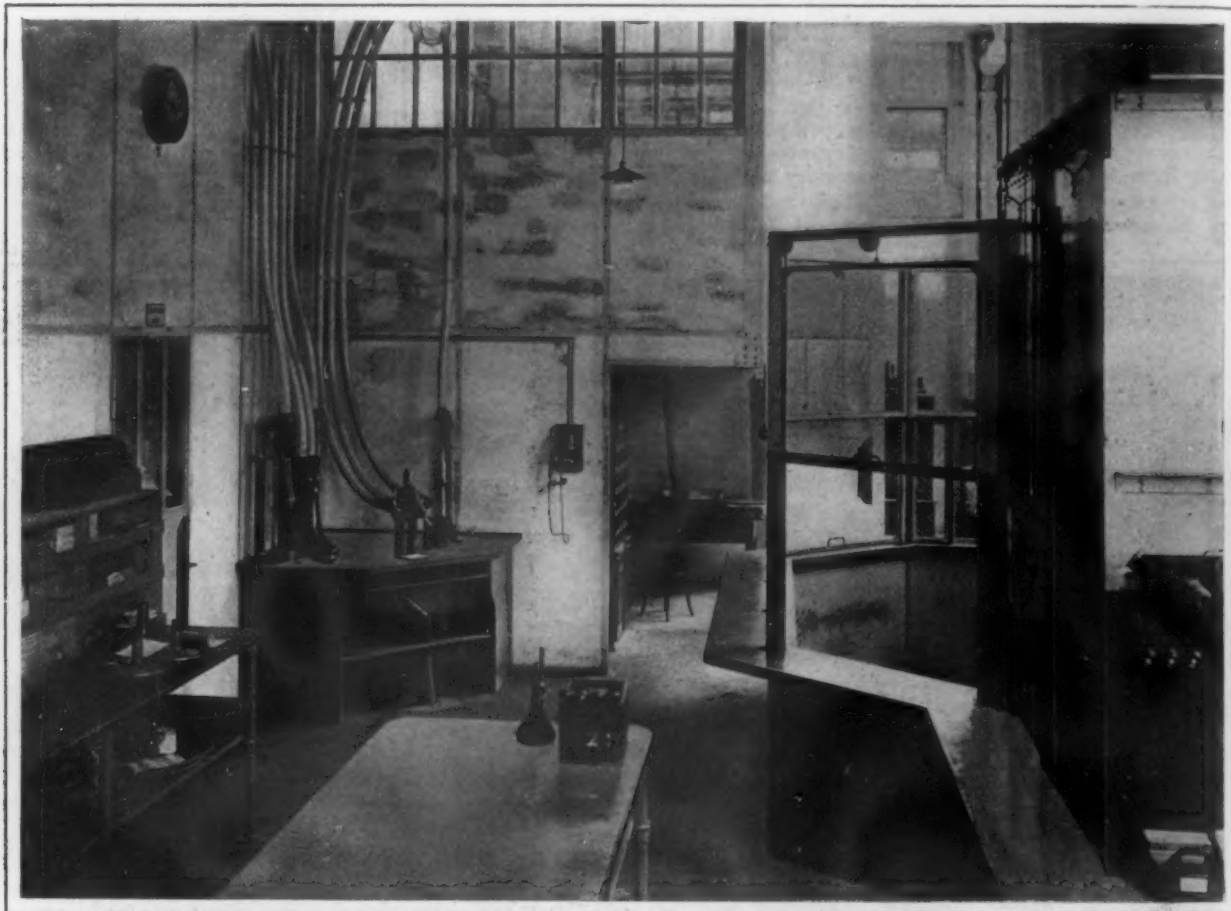
as the necessity may demand in smaller or greater proportions in the various parts of the works. In connection with this storage system has been developed a department which besides maintaining a continuous inventory of stocks, has been able to effect remarkable economies in manufacture through the standardizing of similar machine parts used by different departments.

The Winterthur works is much the larger of the two big plants of Sulzer Brothers, the other, located at Ludwigshafen, near Mannheim, however, being more recent.

Located in Germany, it was one of the plants visited officially by the American engineering party, while the Winterthur works were not. The latter represent the growth of an industry which started in 1834, as a small brass foundry, and to-day it has attained large proportions, comprising many buildings and devoted to the manufacturing of very small as well as very large products. The Diesel engine looms large as one of the special and prominent activities of the works at this time, and the company has in this connection a close interest for American readers, owing to the fact that the American firm, the Busch-Sulzer Brothers-Diesel Engine Company, at St. Louis, is manufacturing Diesel engines, with the advantage of the experiences of Sulzer Brothers at Winterthur.

Besides the Diesel engine, centrifugal pumps are made in a wide range of sizes. Generally speaking, the scope of products is practically too great to attempt to mention them all. One finds the anomalous condition of a large

terminating in a freight elevator which may take up industrial railroad trucks and transfer them to tracks continued on the different floors of the building. Small lots and light goods are lifted by an endless conveyor, which takes the form of two wells, side by side, in one of which are the up-going platforms placed at relatively close intervals, and in the other the descending line of platforms, this system operating similarly to the continuous passenger elevator common in German factories, in which the platform is transferred from one well to the other as it completes its upward or downward travel, as the case may be. Being operated continuously, there is no need to wait for cars, and the receiving clerk, of which there is one on each floor of the storage building, is notified by a bell when material is on the way to him. Incidentally, it is emphasized that the conveyor has proved well adapted for the work, and is always ready for its business and does it at a small cost. The accompanying illustrations



Articles from Stock are Obtained on Order Received at the Counter from a Messenger. The Order is Transmitted by the Pneumatic Tube to the Floor Where the Material is in Storage and the Goods Received from the Endless Elevator or Conveyor, Shown at the Right, are Delivered to a Messenger. In the Background are Seen the Files for the Records

boat being erected for use, for example, in passenger service on some of the Switzerland lakes, the inland location of this plant requiring substantially a knock-down metal hull, the curved plates and other parts being bolted in process of assembling and then taken down into sections and shipped by rail to the lakeside where the boat is to be put into commission. Similarly for a plant located in mountainous Switzerland, it is noteworthy to mention the manufacture of large steam boilers, steam engines, refrigerating machinery and special machinery for export not alone to other parts of Europe but for trans-oceanic shipment. The manufacture of heating boilers and radiators and apparatus for heating and ventilating systems is also a large part of the output of the Winterthur plant.

The storage building and the entire system of handling materials came into being in connection with a systematizing of manufacturing along modern lines and the rebuilding of a portion of the works which has taken place in the last few years. The storage building is of steel cage construction, selected because of its good utilization of the restricted area available. The storehouse is within easy reach of all shops and yards by a system of tracks

will serve to help in an understanding of the general scheme of operation.

A specially interesting feature of the storage system is the equipment of the shelving. It consists mainly of pipe posts, each screwed into a blank flange at the bottom, and angle bars having the ends pressed to form clamps to fit in pairs around the posts, as indicated in the illustrations. Each pair of angle clamps, joining a pair of posts, may be bolted at any desired height, and the shelving, consisting of planks laid on the flanges of the angle bars, may thus be given the clearance desired for the material to be placed in storage. The posts along the length of the shelves may be spaced as far apart as desired, depending also on the character and size or weight of the material.

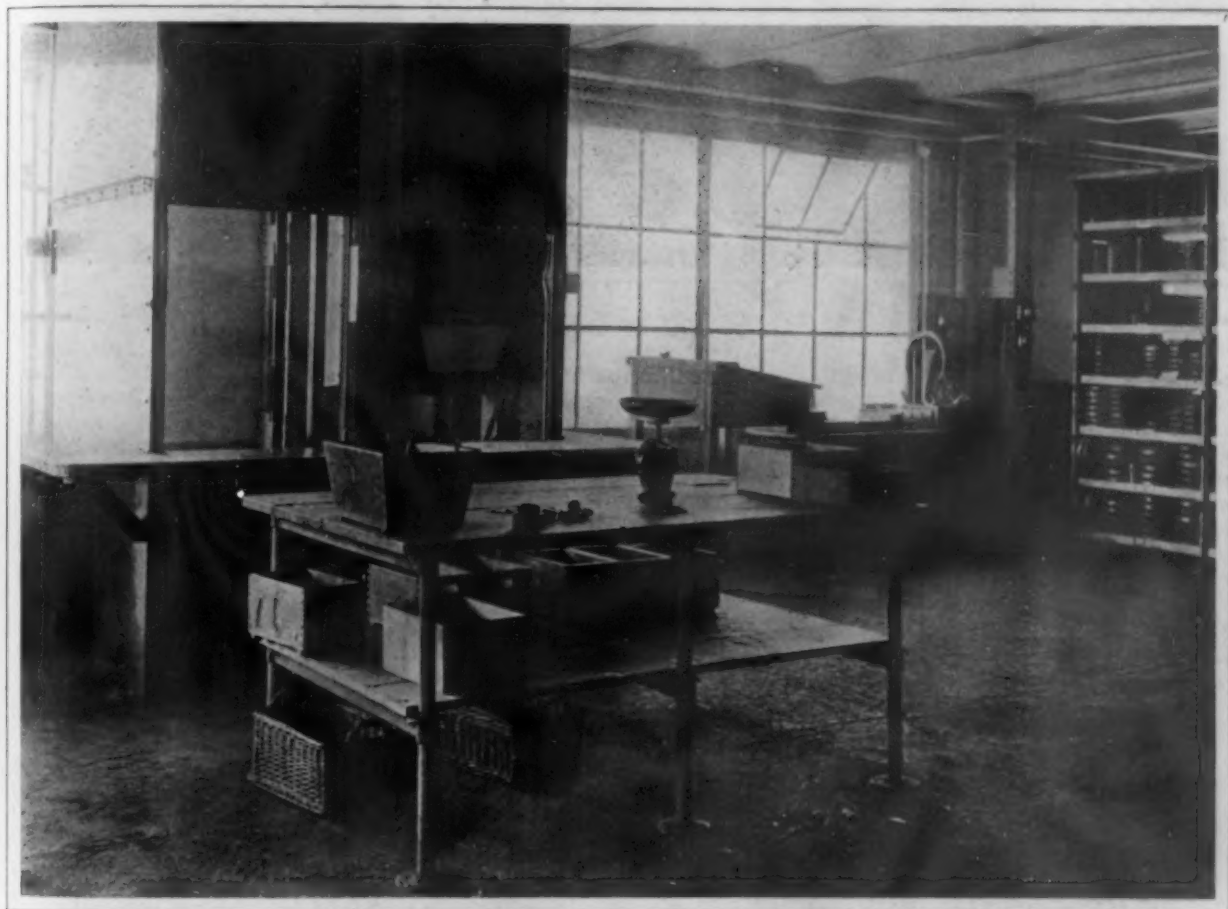
For such stock as machines partly constructed, like parts of centrifugal pumps, centrifugal blowers, pulleys, large T's for piping work and for bar material, leaf springs, etc., the plain shelves suffice. The sections of the shelves are, however, sometimes divided by a wooden partition, and some of the illustrations will show the use of a wooden board cut to the length to fit between the posts,

with an iron strap around the post to hold the board in place and to give stability to the partition. In the storage of small articles, where it is desired to provide bins, not only with partitions spaced between the iron posts along the shelf, but also to divide the shelf into two parts, longitudinally, an ingenious little iron part is used. A photograph of this has been reproduced, and it is noted it comprises a small piece of light plate, bent to form a groove to hold a board and provided with four points or prongs, which are forced by a hammer into the timber shelving. Thus, wherever a partition is wanted, one or more of these iron parts are forced into the shelving and the vertical wood partition fits into the groove.

The main storehouse, besides containing the supplies, tools and other materials used in manufacturing, and the standard machine parts of castings in the rough, also accommodates the works' central office in charge of materials. In addition to the details of the method of storage,

a portion of the ground floor of the main storehouse. Goods are all held here for recount, weighing and inspection. Equipment is at hand for testing materials, as well as finished articles that are bought on order. Written reports are made to the offices of all deficiencies. The goods passing inspection are reported on a list of items, which is attached to the shipping papers and on delivery is turned over to the central administration bureau of materials located in the same building. The central office checks the incoming materials with the orders that had been placed for them with outside concerns and forward the papers to the auditing office for attention to the bills.

The other division of the input, which consists of articles manufactured for stock or to be kept on hand for orders, is checked and tested in the shops and does not pass through the receiving room, but enters the stores directly through the elevator with a similar list of items made out by the foremen. Articles for stock and for



The Accommodations of the Store Clerk on Each Floor Near the Endless Conveyor. In the Background May be Seen the Store Clerk's Desk and a Pneumatic Tube Station. A Tray is Shown on the Right Hand Side of the Conveyor Going Down

considerable interest attaches to the workings of the central office. It has watchfulness not only over the products in the storehouse, but also over the chain of other stores distributed over the works and its outlying branches, utilizing, as stated, the standard form of shelving. It has watchfulness over everything but the products in the course of manufacture. Even finished goods, which are kept in the shipping room, are really in charge of the storage department, as is everything not in the course of manufacture or not in use. The point is that nothing is left to lie around. Raw material, for instance, and also unfinished parts of machinery, built in series, are stored in or near the shop concerned. Time and ease in handling are considered throughout and this is indicated in the special provisions for storing oils. These are kept in separate well guarded underground vaults and the various brands are filled into a series of tanks which are equipped with an American tapping device which measures the liquid as it is being poured into any receptacle.

The input of the stores is managed in two divisions. One comprises the deliveries from the outside and the other the deliveries from the shops themselves. The former pass through the receiving department, occupying

individual orders are identified therein and parts of orders delivered ahead are distinguished by colored cards. The latter contain notes as to patterns, materials, finish, time of delivery and other data. The papers of this class, after passing the central office, are turned over to the calculating and bookkeeping departments.

The orders for material to be released from storage are issued in general by the foremen of the several shops. They are based on the complete lists of pieces that are made part of every shop drawing and contain full instructions as to the articles on hand, to be utilized or to be made. Printed forms are used for standard and current articles. Others are made out as required. These orders are all brought by messengers to the counter of the dispatching room, located at the base of the conveyor, and forwarded from there through the pneumatic tube system to the proper storerooms. The attending clerk will then proceed to fetch the goods, generally gathering them into a box and starting it down the conveyor. After checking, the lots are turned over to another messenger for delivery, as directed by a card. The entire operation of getting supplies from the stores is now performed in a fraction of the time that used to be consumed. At the end of each



Goods Reaching the Sulzer Brothers Plant on Order are Brought Into the Receiving Room Where They are Checked and Must Pass Inspection or Tests. In the Center There May be Noted the Device for Verifying Pressure Gauges

day the copies of all orders filled are sent up to the central office.

The principal duty of this central office is to keep track of the very great multitude of articles in its charge. The method in use constitutes, so to speak, a continuous inventory. By means of a comparatively simple system of cards every employee can tell in an instant the quantity and quality of any of the supplies, raw materials, as well as of any standard parts and unfinished machines actually at hand. The system also detects waste and casual losses. It is built up on one hand from the duplicate order slips,

such as are made out by the foremen in the shops, reaching the office from the dispatching room, and on the other hand from the records of the receiving department and the delivery cards from the shops, accompanying the products to be stored. The slips are first sorted and then turned over to the clerks who will enter each single item on a card. This card is designed to register both input and output of any article carried regularly in stock. The transfer of irregular goods is recorded separately, but on the same principle.

Of the standard machine parts there are different



The Adaptability of the Shelving to Various Stores is Indicated in the Application of Pipe Hangers for Supporting Chains

kinds which doubtless number many thousands. Consequently as many cards are to be kept up and filed. These must show at any time the number of pieces and weights in the stores, as well as the rate of consumption. For each of these articles the least and greatest number that ought to be kept on hand, as determined by experience, is stated on the card, so that when entering the outgo, the clerk will note if the stock is nearing the low mark and may cause it to be replenished. On the lists from the shops he may also find such articles as are not kept in storage. It is his duty to have these ordered in time, so that they will be on hand when needed. Unused surplus is returned to the stores with identification so that the material can be credited and re-entered as stock on hand. Special cards are also filled out for keeping track of articles which are likely to be of service only occasionally.

The method of recording outlined

For this purpose and for other reforms that grew out of it, a bureau of standards was organized, the staff being composed of well trained men from every department. One of the first tasks was the sifting of the existing standards and the weeding out of useless duplicates and old notions. While formerly the steam engine, the Diesel motor, the pump and most of the other departments had their own standards, all of these branches now use, as far as possible, the same type of handles, valves, etc., and many other simple and composite machine parts, which have been picked out as the most suitable all around. The

number of different pieces to be kept on hand is thereby greatly reduced, while at the same time the number of those that can be made in lots is much increased. The quantities now in demand permit a more general use of automatic machinery for manufacture and outside orders can be placed at better terms.



The Boards Forming Bins for Small Machine Parts and Supplies are Held in the Vertical Position by Means of the Special Iron Part Shown in the Small Cut Above. This is Formed of Heavy Steel Sheets Bent Upward to Receive the Edge of a Board say $\frac{3}{4}$ In. Thick and Having Downward Projecting Points at Each End so that the Support May be Forced Into the Wood Shelf at any Desired Position

is applied not only in the central storehouse, but for the numerous collections of raw materials and unfinished goods in local storerooms, as well as for a system of intermediate storage serving to collect all finished parts of an order, until they can be released for shipment.

The efficient administration of materials presents, however, but one side of the storage problem. It does enable the owners to manage the stock to best advantage and leaves everything ready for instant use, but it does not acquaint the personnel, especially the technical staff, with the resources at hand. This is essential in order to realize the full benefit of the system. To secure the desired co-operation it was necessary, first of all, to train or induce the men to consider the standard goods in their designs and to list them properly for the shop. It was further necessary to advertise the material constantly, so that the new practice would be kept up. Finally the rules had to be enforced by checking all drawings and lists issued to the shops from this point of view.

The number of standard articles is now about 15,000. It is needless to say that an ordinary card system would be inadequate to describe the goods and any form of catalogues would not be practicable in keeping up to date. Another medium had to be developed for putting before the engineering and drafting force the materials which they are to use. The problem was solved by a series of uniform drawings giving dimensions of all sizes kept, the quality of material, the finish and all other pertinent information. Most of this is imparted by a system of numbers, signs and abbreviations, which has since been introduced and applied to all shop drawings. The standards are classified, the sheets bound together in groups and supplemented by indexes and explanations. Large editions are printed of these sets. They are widely circulated throughout the establishment and made accessible to everybody. The different classes of articles are recognized by the color of the bindings; in fact, everything is made handy for the employees. The bureau of standards takes

care of all revisions and additions to the publications.

A characteristic feature of the system are the numerous articles which are listed as half finished, such as odd flanges, the body of which may be made in numbers, while the tappings can be ordered to suit. Again, many of the standards can be utilized for special needs through a simple operation, such as cutting off or drilling, which is still cheaper than specially designing and forging the piece. But these points would not be taken advantage of without the watchfulness of the bureau and its method of imparting the intention to the shops by certain signs on drawings and lists.

A new development in manufacturing, that is facilitated greatly through the storage system, is the production of what might be called semi-ready machinery. This is being gradually extended to all specialties which are designed in standard sizes. An example of this are the centrifugal pumps. Owing to the great variation in requirements, only a few of the smaller units were formerly made in series and kept in stock. About 80 different sizes are now built on the new plan. This has become feasible by standardizing the parts that are common to several types and capacities. These parts are made in certain numbers, according to recurrence, and held in storage until wanted for filling an order. With the old plan of building on demand, such an order required months for execution when the foundry and other shops were busy. At present, almost any order can be filled by assembling and testing a combination of parts at hand and delivery can be made on very short notice. To many readers it might seem a matter of course to manufacture a limited number of sizes for stock. It should not be forgotten, however, that the efficiency of centrifugal pumps depends to a considerable extent upon the adaptation of the machine to the conditions under which it is to work. The customary over-commercialized method of making and selling these machines is not regarded as compatible with good engineering. The method outlined here combines in a measure the technical with the commercial ideal of efficiency.

The systematic handling of materials and products has also induced or forced reforms in other directions. The listing of standard parts and the system of numbering introduced with it in the drafting rooms brought about a revolution in the storage of patterns for the foundry, which had long been pending. The renumbering and sorting of the 100,000 and odd accumulated pieces was carried out in conformity with the system introduced by the bureau of standards. The restorage and indexing restored much of this property, which had been as good as lost, to the owners, by making it immediately available.

The keynote of the entire system is, indeed, the task of keeping the vast resources of the establishment always at one's fingers ends. It is not merely a time-saving device, but intended also to foster a community of interests among the numerous departments for efficient general co-operation.

Improved Automatic Sand Mixing Machine

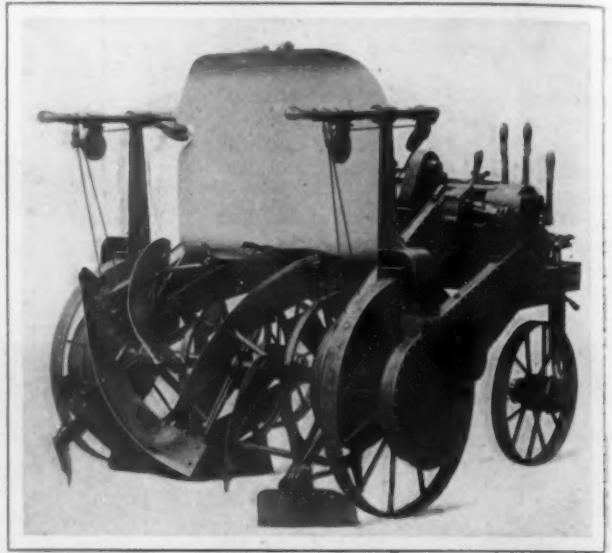
The Sand Mixing Machine Company, 220 Broadway, New York City, has introduced improvements to its automatic sand mixing machine. Roller bearings are now used, protected against the entrance of dust and dirt, and chains, sprockets and gears are all inclosed. The side frames are one-piece steel castings joined by heavy angle irons. The transmission gears are of steel with cut teeth and are incased and run in an oil bath.

Where chains and sprockets are used for the transmission of power, they are also covered, as stated, the object of course being to protect the operator from all chance of injury. Hyatt roller bearings are used in the front wheels and the cutting cylinder, each main bearing being dust proofed with a leather washer and three hard grease rings. The cutting cylinder is raised and lowered by power, the movement being regulated by a hand lever.

An electric motor of from 5 to 10 hp., depending upon the size of the sand heap, supplies the power to drive the machine into position and perform all the operations. The power is taken from a conveniently located electric light socket through a flexible cable, and the take-up reel is carried upon and actuated by differential shaft, which is above the frame line, an arrangement which it is pointed out simplifies and reduces the amount of mechanism. The

electric contacts are located inside the reel drum and the closing of both ends is relied upon to protect the contacts from moisture and grit.

In use the sand is shaken out on the floor where it is to be used, is wet down and cut over once by the machine, which is all that is required, except in the case of radiator



A Recently Developed Motor-Driven Automatic Sand Mixing Machine Having the Moving Parts Specially Protected

sand which is cut twice, as it does not take the water readily, until partially moistened and cut over once. The cutting blades make a cut from the top to the bottom of the heap every $\frac{1}{2}$ in. As the blades travel at a high velocity, the impact tends to break any lumps and the sand is thrown into the air at the bottom of the machine, the grains being separated and aerated. Emphasis is laid upon the fact that this action frees the sand from gases, renews and prolongs its life and also improves its molding qualities. When the machine is cutting sand for stationary molding, it piles it in the stall by the bench or squeezing machine, thus saving the necessity for carrying back the molds, or shoveling by hand, and at the same time the sand is cut.

Winding Up Diamond State Steel Receivership

In the United States District Court at Wilmington, Del., November 27, Horace G. Eastburn, attorney for the bondholders of the Diamond State Steel Company, who recently filed exceptions to the twenty-fourth account of the receivers as to the \$1,644.46 credits claimed for salaries and rent paid subsequent to the twenty-third account, withdrew the exception. The twenty-fourth account was then confirmed by the court and an order will be made directing the receivers to pay the balance in their hands into the court on or before December 13.

Attorneys for James P. Winchester and Howard T. Wallace, the receivers, filed a petition praying for a reconsideration of the allowance made by the court for compensation for their services and for the grant of such further substantial sum as the court shall deem just. Recent proceedings in the Chancery Court, the petition claimed, show that the sale of the plant for \$75,000 by the receivers was advantageous and favorable, and was due to the special efforts and influences of the receivers. The court fixed December 15 as the date for the hearing upon the petition.

The shipment of rails and structural steel from Chicago mills by lake has not yet grown to the point of involving large tonnages. It has, however, assumed a sufficient importance at the South works of the Illinois Steel Company to warrant the development of a systematic method of handling such shipments, with the result that in October new records for the season were made. On October 17 1962 tons of rails were loaded into the steamer Dalton in 18 hr. and 15 min. and on October 28 4312 lengths of rails were loaded into the steamer Howe in 12 hr., or a single turn.

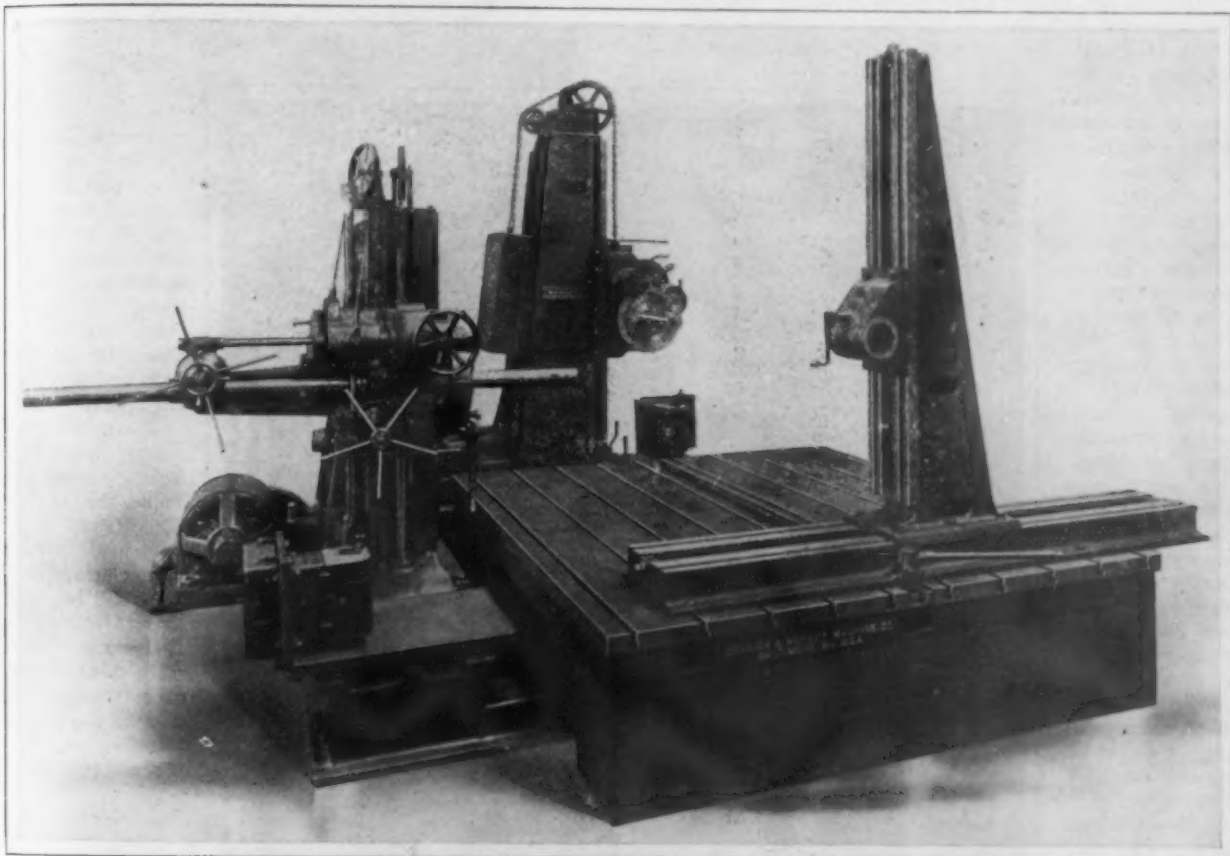
A Duplex Floor Boring and Drilling Machine

For boring and drilling heading machinery frames and handling similar work, the Detrick & Harvey Machine Company, Baltimore, Md., has brought out a duplex floor boring machine. This consists of one of the builder's standard No. 2 horizontal drilling, boring and milling machines, with a spindle saddle having a vertical travel of 60 in. on the column, and a No. 0 machine with a 40-in. spindle travel, set at right angles to it.

The runways of each machine are bolted to bedplates of any desired size and in the accompanying engraving the bedplate is shown raised to permit the spindles to be brought close to it, the distance between the spindle in its lowest position and the work bed being about 13 in. The columns travel horizontally on the runways, the exact amount being varied in accordance with the requirements

Belle City Malleable Profit-Sharing Plan

The Belle City Malleable Iron Company, Racine, Wis., which recently increased its capital stock from \$125,000 to \$200,000, has inaugurated a scheme of profit-sharing for the benefit of its employees. The amount of \$175,000 of preferred stock has been set aside for which employees are to be permitted to subscribe. The preferred stock provides that dividends at the rate of 6 per cent. per annum shall be paid upon it before any dividends can be paid on the common stock; a further provision is that after dividends on the common stock have equaled 6 per cent. per annum the preferred stock will share equally in any further dividends which may be paid. The company agrees to pay to employees who subscribe for stock 2 per cent. per year additional for a period of five years. An employee may subscribe for stock up to the amount of



A Duplex Floor Boring and Drilling Machine Consisting of Two Standard Machines Placed at Right Angles to Each Other for Finishing Work with a Minimum Number of Settings

of the purchaser. The boring of the work is accomplished at a single setting and the milling, drilling, tapping or other operations can be performed on four sides with only a single additional chucking. Conveniently located levers, arranged so as to be non-conflicting, control all the movements, both fast and slow, of the two machines.

The spindles, which are 5 and 3½ in. in diameter respectively are of high carbon hammered steel and are driven from the front or working end. The spindle on the No. 2 machine has a continuous feed of 36 in., while that for the spindle on the other machine is only 24 in. Automatic milling feeds are provided for both machines and there is an outer support for the boring bar on the No. 2 machine.

The combination is arranged for motor drive, a 10-hp. direct-current, adjustable-speed motor, with a range of 2 to 1 being used. All the gears are of steel or bronze, belts having been entirely eliminated.

A. W. Wheatley, general manager of the Canadian Locomotive Company, Kingston, Ont., announces that the company will build 16 consolidation locomotives and 10 switching locomotives for the Intercolonial Railway.

The Joliet Rolling Mill Company, Joliet, Ill., manufacturer of bar iron, has let a contract for additions to its plant which will increase its capacity 100 tons per day.

his annual wages. If, however, the amount available for sale to employees should be oversubscribed, all subscriptions may be scaled down accordingly. The price of the stock will be \$100 per share, and the employee can pay for it at the rate of \$1.50 per share per month. The company will charge interest for the unpaid portion at 5 per cent. per annum, so that the stock should pay 3 per cent. per year more to the employee than he is paying as interest on the delayed payment.

A wire-fence or netting making machine, which has given a good account of itself, is referred to in a communication from the manufacturers of the machine, Wagner & Ficker, Reutlingen, Germany. It appears that the machine was placed for 8½ hr. under the observation of a notary public of Reutlingen, and he has sworn to a statement that 811.6 sq. m. (970.7 sq. yd.) of wire netting was made and rolled up in that time, manufactured of what corresponds to No. 14 wire and formed in 2-in. meshes and 48¼ in. in total width.

The Lima Locomotive Corporation, Lima, Ohio, has taken an order from the Great Northern Railroad for 40 locomotives. This order, with other work on hand, will keep the company's plant busy until well along into next summer.

Methods of Handling Materials in Shops

Some of the Details Which Go Toward Reducing the Non-Productive Costs in Manufacturing—Suggestions Which an Investigation Develops

—BY HARRY C. SPILLMAN—

Factory managers and engineers have found that time study and scientific arrangement of machinery have made a great increase in the output of their plants. However, this investigation has been applied mostly to the productive departments. A study of the non-productive side of manufacturing has brought about improvements which also show a great saving.

One of the largest non-productive items in a plant is the handling and moving of material. Short cuts for doing this work show a wonderful saving. There is no question that cost of production is increased when material in the course of manufacture is forced to retrace its steps and is delayed in moving from one operation to another. It is a great saving to have the proper kinds of trucks, cranes and other equipment to handle this work in a quick and efficient manner. Very often a simple truck or clamp "made in our own shops" will accomplish a great saving. One of the first items to investigate is the routing of material. The stock, during the different processes of manufacture, should travel in one direction. This avoids having the truckers meet with each other in the aisles and keeps the material from retracing its course from machine to machine.

Decreasing the number of times necessary to handle the material is another important item. Very often machines can be so arranged which allows the stock to pass from one operation to the next without rehandling or trucking. The picking up and placing of the material on the trucks consumes a large portion of the trucker's time and interferes more or less with the workman at the machine. Very recently a number of special trucks have appeared on the market which allow the material to be placed on platforms. When the platform is filled the truck is backed underneath—the load slightly elevated—and hauled away. Fig. 1 shows these platforms with a special rack for crank shafts. The lathe operator takes the rough cranks from one rack and when the machine operation is completed he places the cranks on the rack to his left. When the rack is filled the trucker backs his truck underneath the platform and delivers the cranks to the grinding department. From the grinding department they are conveyed on the same kind of platforms to the inspection, finished

stores and assembly rooms. This system of trucking avoids lifting the cranks from the floor by the machine operator, greatly increases the efficiency of the trucker, as he spends most of his time trucking instead of loading and unloading material. It keeps the finished cranks from becoming marred due to rough handling, the clogging of aisles with material, and is effective in increasing production.

For progressive assembly special designed trucks and assembly wagons have proved a great saving as the machine or motor can remain on the same wagon during the entire assembly period.

Fig. 2 shows a special truck for assembling automobile motors. The partly assembled motor is placed on this truck where assembling is completed. It passes from one motor assembler to the next and into the inspection and testing departments without being removed from the truck. This truck is a homemade affair and is fitted with four ball bearing casters.

Using mechanical means for the transportation is the most effective way for taking care of material. For long hauls between buildings and in yards the monorail system gives good results. A monorail conveyor with operator's cab a part of the conveyor and fitted with a grab

bucket will unload a car of coal and place it in the coal bins for the stokers of a boiler plant in less than 3 hr. By means of a switch the same crane handles the ashes in the boiler room. The use of this crane has eliminated three men in the power house and shows a labor saving of \$2200 per year.

An electric storage battery truck such as has been shown in *The Iron Age* cuts down trucking costs for long hauls in and around a plant. These trucks are operated by a storage battery which furnishes the current for the electric motor. They are self contained and take very little power for operation.

The use of electric cranes is another effective way for handling material; they are quick, safe and do away with trucking aisles. Manufacturing plants are just beginning to realize the great value of cranes, and instead of confining the crane to the power plant and foundry they are being used throughout the plant for lighter work. A small electric traveling crane, for example, is used for handling motors in a test room. These motors are com-

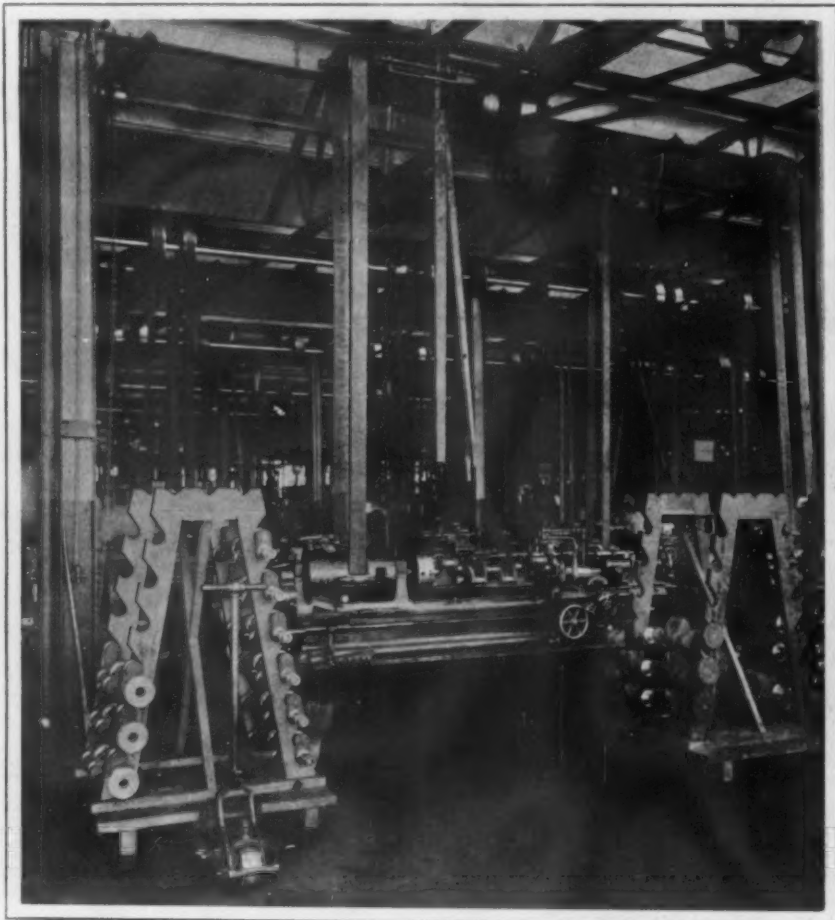


Fig. 1—Platforms with Racks, One for Rough Cranks and Other for the Machined Cranks



Fig. 2—Special Truck for Assembling Automobile Motor

paratively light material, weighing roughly 400 lb. each.

A subject which has never been given sufficient thought is special clamps for lifting. A little study on clamps will make a vast improvement when handling material with a crane. Usually a sling is made out of rope or a chain which takes considerable time to attach, and there is more or less danger of the sling breaking or marring the finished product. Special clamps can be made which are instantly applied. The clamp shown in Fig. 3 attached to the motor is designed to grip tighter as the load increases. The jaws are lined with leather to avoid marring the motor. These clamps are made out of $1\frac{1}{4} \times \frac{1}{2}$ -in. stock and can be easily forged out at the blacksmith shop. Fig. 4 shows a special clamp for handling a crate which works on the same principle as the motor clamp.



Fig. 4—Form of Clamp Used for Handling Crates

When investigating the handling of material the subject should be considered in all its phases. The time and labor saved and the increase in production should be figured without losing sight of the interest and depreciation charge which might offset this saving. Every item which is affected should be weighed in the balance and carefully compared. Unfortunately it is impossible to standardize trucks like other equipment, as too many variables enter into the solution. The kind of material, weight, size,

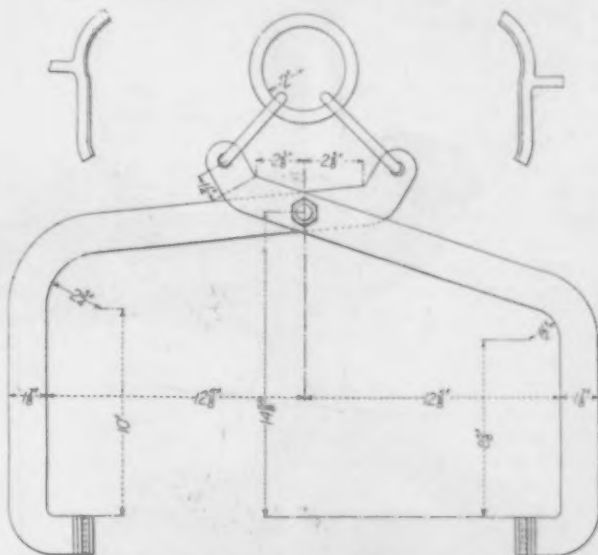


Fig. 3—Modified Form of Clamp with Jaws Shaped, as Shown in the Part Plan, and Leather Lined to Grip Without Marring a Product Regularly Manufactured, but of Odd Contour

quantity, length of haul, finish of material, width of trucking aisle, overhead room and other quantities all have a direct bearing on the system to be adopted.

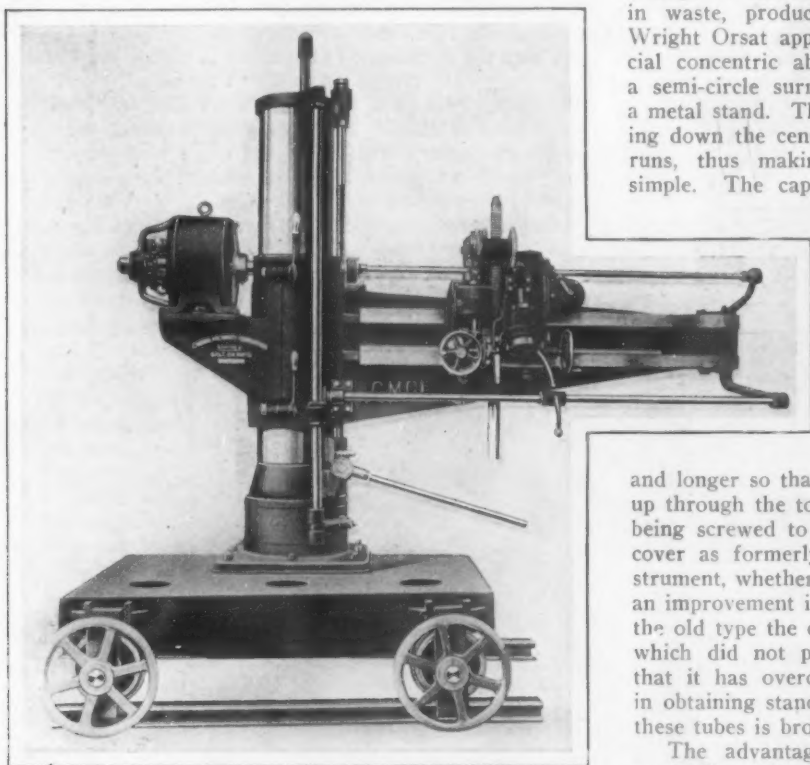
United States Metal Products Company's New Officers.—At a meeting of directors of the United States Metal Products Company, College Point, Long Island, N. Y., A. B. Turner, of Turner, Tucker & Co., bankers, 111 Broadway, New York, was elected president. W. T. Smith, formerly vice-president of the Thompson-Starrett Company, was elected vice-president and general manager, and A. M. Bowers was elected secretary and treasurer. It is stated that Mr. Smith, who is an expert on organization work, has been given full power to put into effect whatever changes he may deem necessary. Drastic cuts are being made in overhead charges. It is understood that the company is in much better condition than was at first believed, and that it may not be found necessary to call on the syndicate which was formed to advance what money the company might require. It has on its books \$600,000 in unfilled orders, which will take more than six months to fill.

The plant of the American Stamping & Enameling Company at Bellaire, Ohio, will be removed to Massillon, Ohio. A deal for the removal has just been closed between the Geiger-Jones Company, Canton, Ohio, which is interested in the Massillon Rolling Mill Company and allied interests in Canton and Bellaire, and the Massillon Board of Trade, according to the terms of which the stamping and enameling company will establish its plant in Massillon at a cost of approximately \$350,000 and employ 300 to 500 men. The company is to be given a 20-acre tract and \$30,000 toward the expense of moving, and will buy 40 acres additional for its site.

The first of a large number of suits brought 20 years ago by the Illinois Steel Company against so-called squatters on Jones Island, Milwaukee, to determine the ownership of the land, has been decided in favor of a squatter, the Milwaukee Circuit Court holding that the heirs of the squatter held title to the property by virtue of adverse possession. It developed in the hearings that the northern part of the island was practically washed away by wave action and that the squatters built up the land. Twenty-two other cases are pending.

A Portable Radial Drilling Machine

In connection with the new St. Lawrence bridge, a specially designed machine shop was erected at Lachine by the St. Lawrence Bridge Company. The equipment fur-



A Recently Developed Portable Radial Drilling Machine Designed Especially for Use in Connection with the Machining of Bridge Members

nished for the shop was specially designed to meet the conditions imposed by the kind of material used and the size of the parts handled. Among the equipment in the shop are 40 radial drilling machines supplied by the Canada Machinery Corporation, Ltd., Galt, Ont., Canada. Of this number 16 are arranged for mounting on a floor plate and the remaining 24 have trucks as shown in the accompanying engraving. The portable machines are arranged to run on a standard gauge track and can be moved from place to place as conditions require. The truck can be clamped rigidly to the rails and one of the special features of the design is the ease with which it is possible to unclamp the truck, move the outfit to a new position and quickly clamp it in place again.

A direct-connected motor is mounted on the arm, which is 76 in. long, and drives the drill spindle through spiral gears and an intermediate shaft. It is pointed out that this arrangement gives a direct and strong drive. With the exception of the guide bearings of the spindle itself, ball bearings are supplied throughout and the spiral gears are made from high carbon steel and bronze, being entirely inclosed with a large grease cup for lubrication. The motor used is of the adjustable-speed type, the range being considered sufficient for the work required and for that reason no change gears have been provided. The feed is of the all geared type with four changes, and both a quick return and a slow hand motion are available. The controller handle of the motor travels with the carriage, thus enabling the operator to start and stop the motor or change the speed without leaving the carriage. Another handle traveling with the carriage locks the arm, an arrangement which it is emphasized is a great convenience for working at the end of a long arm, since the operator does not have to leave the carriage whenever it becomes necessary to make changes in the vertical adjustment of the arm on the round column.

In a test of the machine holes $1 \frac{3}{16}$ in. in diameter have been drilled in high carbon steel at the rate of 10 in. per min. and it is pointed out that by reason of the ball bearing equipment a very large percentage of the horsepower developed by the motor is delivered to the spindle and thence to the point of the drill.

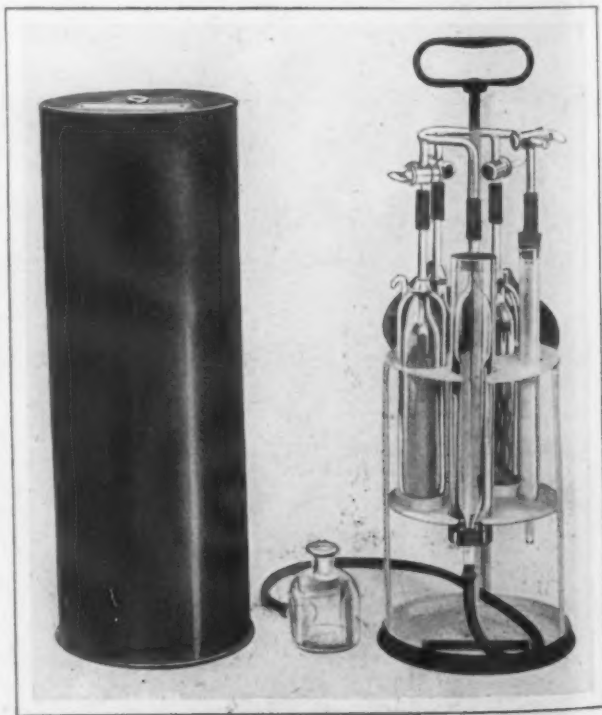
A New Design of Gas Analysis Apparatus

An Orsat apparatus that has some new features is being placed on the market by the Precision Instrument Company, Detroit, Mich., for determining rapidly the percentage of carbon dioxide, carbon monoxide and oxygen in waste, producer, generator and other gases. The Wright Orsat apparatus, as it is known, consists of special concentric absorption bulbs or pipettes mounted in a semi-circle surrounding the water jacketed burette on a metal stand. The burette is made with an enamel backing down the center of which of a colored enamel stripe runs, thus making an accurate observation easy and simple. The capillary tube is mounted in a way that danger of breakage is reduced. The apparatus has a filtering tube for cleaning the gas and a bottle containing water for drawing in the sample and passing it to and from the burette and absorption bulbs. The latter are fitted with rubber bladders to keep the solutions free from contact with the air. In the improved machine the central rod has been made larger in diameter

and longer so that its strength is increased and it extends up through the top of the outer case, the carrying handle being screwed to this rod instead of being affixed to the cover as formerly. This makes it easy to carry the instrument, whether the cover is on or not and has permitted an improvement in the method of fastening the cover. In the old type the cover was fastened by a hasp and staple, which did not prove satisfactory. The company states that it has overcome the trouble previously experienced in obtaining standardized capillary tubes so that if one of these tubes is broken it can easily be replaced.

The advantages claimed for the apparatus are its portability, durability, compactness, accuracy and low cost. The absorption bulbs are compact and strong and it is claimed they are not likely to break. Owing to its compactness the instrument can be lifted and shaken when the gas is in contact with the reagents, thus assuring a complete and rapid absorption of the constituents. The metal cylindrical cover in which the apparatus is inclosed when not in use is $5\frac{1}{2}$ in. in diameter and 15 in. high. The total weight of the apparatus when charged with the solutions is 6 lb. It is made in several forms with from two to four absorption bulbs, different types being provided for different tests.

In operation the absorption bulbs are filled with the



A Recently Developed Orsat Apparatus Having a Series of Concentric Absorption Bulbs Surrounding a Water Jacketed Burette

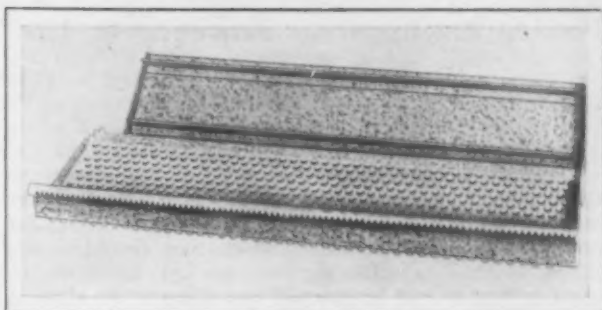
requisite solutions, according to the gases to be estimated. The distilled water or mercury in the leveling bottle should be preferably saturated with the gas to be examined. A sample of gas is then drawn in so as to fill the burette and it is passed into the pipette containing caustic potash, which will absorb the carbon dioxide. The cock on the inlet of the pipette can then be shut off and the apparatus shaken. The gas is then passed back into the burette and the diminution in volume on remeasuring represents carbon dioxide.

The company is making a portable boiler tester designed for investigating flue gases in a form somewhat similar to the Orsat apparatus.

Air Washer for Use in Industrial Plants

The B. F. Sturtevant Company, Hyde Park, Mass., has brought out an improved air washer. It is designed for purifying and cooling the air in connection with ventilating systems, for reclaiming the impalpable powders created in various manufacturing processes, for removing cinders and soot from roundhouses and similar places, and assisting in other ways in abating the smoke nuisance, and also for the removal of odors created in manufacturing. The apparatus consists of three essential parts, the spray chamber, the eliminators and the sump or tank, all of which are inclosed in a galvanized steel casing. Other accessories are the strainer, the pump and the power for driving.

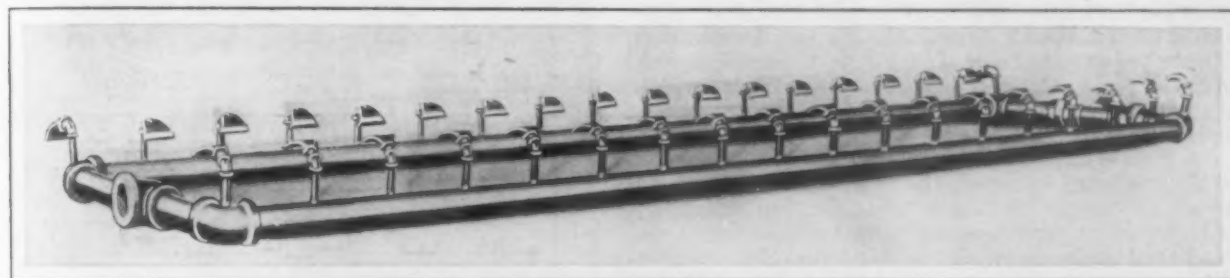
The air washer is placed so that all the air passes through it, a large portion of the washing being accom-



One of the Eliminators for Removing the Moisture from the Washed Air

several times. The front edges of the eliminators are serrated and the surfaces are punched to form lips, which are bent downward. The air strikes against these sharp edges and the moisture is removed, the serrations and lips adding to the efficiency of the washing process. The slant of the eliminators is calculated to give proper drainage and conduct the water into the sump below.

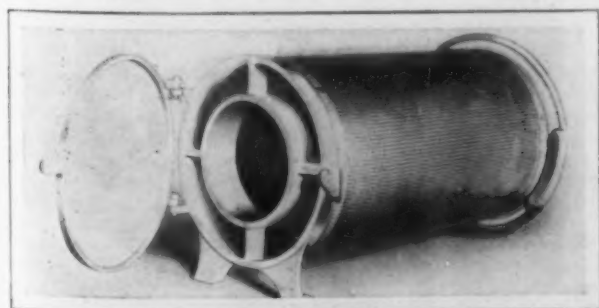
The sump is usually constructed of galvanized steel fitted to the upper casing. Copper rivets are used, the joints are soldered and the interior is covered with black asphaltum paint as a precaution against corrosion. If desired a concrete tank may be substituted. The strainer in the sump consists of two concentric cylindrical screens of perforated brass and end plates of cast aluminum. The suction pipe of the centrifugal pump used enters the one



The Nozzles Arranged in Position on the Spray Pipe

plished in the spray chamber, which is first encountered. The spray is created by forcing water under a pressure of approximately 12 lb. through spray nozzles constructed of cast brass. As the water issues from these it strikes a lip curved over the orifice, which deflects it downward and toward the sides of the chamber in a rain-like spray. The large orifice is relied upon to prevent clogging by sediment or other matter. The nozzles are attached in two sets to a spray pipe located across the top of the chamber. The spray from the front row is directed against the foot of the eliminators, while that from the rear row is directed downward toward the front of the washer. In this way two sheets of spray are formed which intermingle before reaching the sump, creating a cloud of mist which fills the chamber.

The air passing through the chamber must carry some water away with it, either in the form of entrained or unevaporated moisture, and this is removed by the eliminators which consist of galvanized steel plates bent to form V-shaped troughs and punched to provide passages through them. These are arranged horizontally across the washers like a set of louvers and are designed so that the air cannot pass between them without changing its direction



The Strainer with the Double Wall of Brass Screen

end of the strainer, the water being drawn from within the inner screen. This pump can be driven either by a direct-connected motor, a steam turbine or a steam engine, although belt-driven sets, which can be used when it is feasible to operate from a fan motor or engine, can also be furnished.

Rumely Company's Offices Now in Chicago

The executive offices of the M. Rumely Company and Rumely Products Company have been removed from La Porte, Ind., to Chicago. The following officers and their clerical help will hereafter be in Chicago: C. S. Funk, president; M. R. D. Owings, operating vice-president; H. A. Waterman, manager of design and manufacture; J. M. Robinson, general sales manager; J. S. Witmer and B. G. Baker, assistant sales managers; Leo M. Rumely, foreign sales manager; V. E. Bush, sales office manager; C. P. Holton, general purchasing agent, and entire purchasing department; legal department.

J. H. Guy, financial vice-president, and all of the other departments at the general offices will remain in La Porte as at present until further notice. The new Chicago headquarters are on the sixteenth floor of the Continental & Commercial National Bank Building at Clark and Adams streets.

The Wheeling Corrugating Company, Wheeling, W. Va., shipped from its Martins Ferry plant on Friday of last week 30 carloads of orchard heaters to Southern California for use by the orange and lemon orchardists. There were 150,000 heaters in the shipment, which were sent in a special train to reach their destination in eight and one-half days, less than half the time required for the regular run. The Wheeling Corrugating Company manufactures the heaters for the Hamilton Orchard Heater Company and devotes its Martins Ferry plant almost entirely to their manufacture.

Placing Machines for Sequence of Use*

The Trucking Involved When
Machines Are Grouped by Classes

— BY OSCAR C. BORNHOLT† —

Trucking in the machine shop is always looked upon as an unnecessary expense and yet many plants have a large trucking expense. This involves the question whether the manufacturing machines in a machine shop should be laid out in accordance with the sequence of operation, or whether they should be grouped according to the class of operation requiring like machines, such as placing together all milling machines, all drill presses, etc.

Arranging machines according to sequence of operation, as practiced by the Ford Motor Company, has a great advantage over classified machine grouping. In the former case it might be well, on account of the nature of the part to be manufactured, to have a milling operation first, then drilling, then milling, and it would not make any difference what sort of machine followed on each operation. But if the latter arrangement of grouping were decided upon, the operations would have to be arranged so that like operations on the same part would follow each other. For illustration, a milling operation should not come between two drilling operations so that the part would have to be trucked to the drill department first, then to the milling department, and then back to the drill department. Trucking is expensive and all its labor is non-productive.

When machines are placed according to sequence of operation there is no trucking of parts after the first operation is started, as each operator lays the part down in such a place and manner as to allow the next operator to pick it up and perform his operation, and so on. When finished, the part goes either to the finished stock room or assembling department.

A good example of continuous manufacturing is found in the making of tin cans. The body of the can is started at one side of the building in a machine for forming it; it next goes to the body-soldering machine and then to the header which has been fed with the two heads; when the heads are on, the can travels upstairs to have the heads soldered. The first machine sets the pace and the operators of the other machines must keep their machines moving at a similar rate so that the stock will not run short or accumulate. This arrangement therefore helps to increase production. At the Ford plant the machines are arranged very much like the tin-can machines. All parts of a unit assembly are made on machines that are so laid out that the last operations bring them near together. This applies of course only to the large pieces, but all parts of a unit are made in one department under a foreman.

Automatic screw machine parts are made in an automatic screw machine department where one man runs several machines. There would be no object or advantage in placing automatic machines among semi-automatic and manual operative machines. It is well understood that there are many operations that require more than one machine, but they are placed to draw from the one machine doing the previous operation. This gives the effect of the whole operation being done on one machine.

The carbonizing and hardening operations are awkward to have in the machine shop, but at the Ford plant a cyaniding and hardening department is placed in the middle of the machine shop. It is glassed in and thoroughly ventilated with a separate system to carry off the fumes from the cyanide pots. All parts to be cyanided and hardened are led up to this department and thus trucking to a separately located building is avoided. This would amount to several hundred tons of material a day. On account of the great amount of heat generated, the heat-treating and carbonizing departments had to be placed in a separate building where the walls could be opened 60 per cent. Brazing is done in the machine shop, just before the parts reach the assembling department. All shop furnaces are operated with low-pressure air (1½ lb.) and city gas.

As an illustration of unit production, I will take the universal joint which has only four pieces and four rivets.

Assuming a production of 80 pieces per hour is required, it would take 80 universal joint knuckles (male), 80 universal joint knuckles (female), 160 universal joint knuckle rings (halves), 320 rivets. The universal joint knuckle (male) has six operations, as given in Table 1.

Table 1—Operations on the Universal Joint Knuckle

Operation	Work	Machines required	Capacity, per hour
1st.....	Mill square end	2 Millers	40
2d.....	Turn to size, 3¼ in. diameter	1 Lathe	80
3d.....	Turn trunnion ends	2 Duplex drills	40
4th.....	Mill ends, shoulder clearances	2 Millers	60
5th.....	File	Bench for filing	..
6th.....	Harden	Furnace in the hardening room in the machine shop; knuckle to be returned to assemble	..

The operations on the universal joint knuckle (female) are similar. The rings are broached, and then ground on a disk grinder, which is placed in the machine shop. The grinder is equipped with a dust exhaustor and collector so that no emery dust flies to other machines. After all the parts are completed, they are led up to an assembler who also rivets them. They are then inspected and sent to the finished stock room or the assembling department.

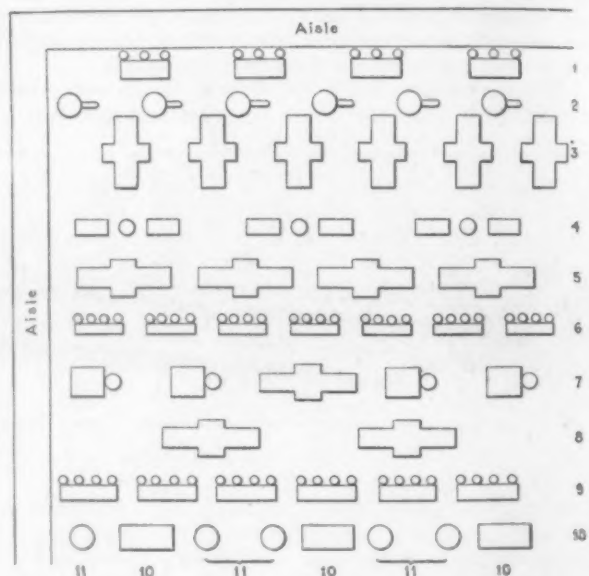


Fig. 1—Sequence Arrangement of Machines in Cylinder Department, Ford Motor Company

usually the latter, since the production of the whole shop must be balanced up.

At the Ford plant, the cylinders are trucked from the foundry to the border of the aisle, down which are located the machines which perform the first operation. They are light enough to be carried by the operators to their machines while the latter are making cuts. The cylinders move to each successive machine until they land in the assembling department which borders the cylinder department. All cast-iron parts are made in the same way; some of the small parts have to be trucked to the assembling department, but in rare cases only. The trucking that is done at the Ford plant is taken care of by many 2-ton monorail traveling hoists operated by electricity and forming a small railway system.

An illustration of the cylinder department for the first few operations is given in Fig. 1, and these are:

First operation—drill, tap and plug three cored holes.

Second operation—spot face and inspect. This is one of the most important operations on the cylinder, since it detects any defect that might have occurred in the foundry. It also finishes spots to enable the placing of the cylinder in the jigs quickly and accurately. Many cylinders are thus saved in this jig because it is arranged to adjust the cylinder to ensure its being finished all over.

Third operation—mill bottom.

Fourth operation—drill six main bearing bolt holes and ream two of the holes for use in gaging or jiggling. The drilling is done in a six-spindle inverted drill press and the two holes are reamed in a single-spindle drill press.

Fifth operation—mill top and sides.

Sixth operation—bore cylinder barrel.

*Paper, substantially in full, printed in the November Journal of the American Society of Mechanical Engineers.

†Mechanical engineer, Ford Motor Company, Detroit, Mich.

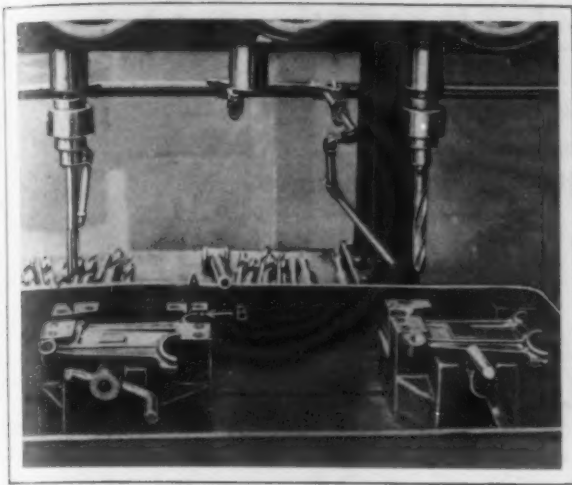


Fig. 2—Machines Rigged so That Each Spindle Performs a Particular Operation

Seventh operation—water test.
 Eighth operation—mill ends of cylinder.
 Ninth operation—finish ream barrel.
 Tenth operation—drill valve seat holes.
 Eleventh operation—drill and ream valve-stem holes, etc., until the cylinder reaches the assembling department.

It may be of interest to compare the two ways of arranging machines for manufacturing by using the cylinder operations of various kinds: In placing the machines according to operations it is necessary only to truck the cylinder to the first operation and after the last, because it is quite necessary to stock a few cylinders ahead of assembling. If the cylinders were to be machined in departments consisting of like machines, it would be necessary to truck to and from each department. Considering 1000 cylinders a day and the cylinders weighing above 80 lb. each, it would total 80,000 lb. to each department.

Grouping the operations on the cylinder to see how many times it is handled in how many departments, there are: drilling, milling, lathe, testing, tapping, babbitting, back to drilling, and grinding. It would be conservative to estimate that the cylinder would have to be trucked about 12 times. On account of some operations it would have to return to a department in which it had already been, and would therefore be handled more times than there are departments. Each handling will amount to 80,000 lb., or 40 tons, and 12 handlings will amount to 480 tons a day, while the total number of feet of movement for each cylinder will be at least 500. This makes 480 tons traveling 500 ft. at the probable rate of 180 ft. a min., which is about the gait of a man trucking. Assuming a man can truck 960 lb., or 12 cylinders, at the above rate of travel, and figuring the necessary time for loading and unloading as 10 minutes, it would require a force of 24 men with trucks to handle the 1000 cylinders per 10 hr.

While it may be claimed that the cylinder is especially adaptable to manufacture with machines placed in accordance with the sequence of operations, small forgings can also be produced in quantities much cheaper in the machine shop when the machines are placed in this way.

The machining of connecting rods shows how this system is applied where comparatively small forgings are used: These are brought in from the forging shops, and begin their passage down the row of machines which are

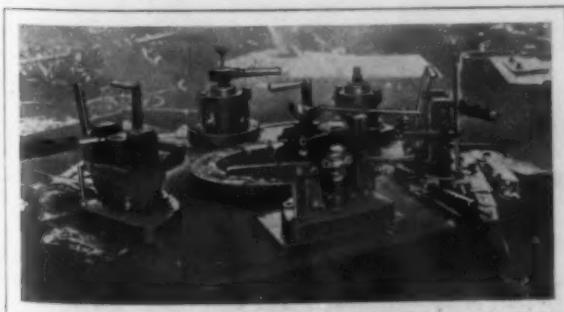


Fig. 3—Furnace Rigged for Rapid Babbitting

arranged for the various operations. Nearly all of the machining operations consist of drilling, and the rods pass from one machine to the next, each being fitted to perform a specific operation. A typical view is shown in Fig. 2, where the wrist or piston pin hole is being drilled and reamed.

As soon as the connecting rods are ready to receive the babbitt, they have reached one of the babbitting furnaces, shown in Fig. 3, which is very near to the last machine. The particular furnace shown happens to be babbitting the caps for the bearings, but is exactly similar in detail to the one which babbitts the connecting rods themselves. After babbitting, the rods are bored; they are then complete and ready to go to the assembling department.

There is another advantage in placing the machines in accordance with the sequence of operations; even though some machines are not worked to their full capacity the amount invested in them is well paid for from the fact that it is not necessary to carry nearly so much stock as when the machines are grouped according to their classification. Each group or department alone would in that case need to have nearly as much raw stock to work with as is necessary with this method to operate the whole series of machines to complete the part.

Improved Eye Protector for Industrial Workers

Safety goggles which are claimed to embody new principles in industrial eye protection have been brought out by T. A. Willson & Co., Inc., Reading, Pa. Instead of the



A New Safety Glass in Which the Weight is Supported by the Sides of the Nose and the Cheeks Instead of the Top of the Nose

saddle resting upon the bridge of the nose there is an adjustable brace bridge designed to distribute the weight evenly upon the sides of the nose and the cheeks.

A safety flange which is part of the rim extends over the back edge of the glass to give resistance to blows struck on the lens and holding the glass securely, thus, it is pointed out, preventing injury to the eye from splinters. The wire side screens are either detachable or else are fastened so that they cannot be removed. The shape of the screens is rather unusual, being long and narrow which, it is emphasized, gives protection without the irritation caused by the edges rubbing and pressing into the cheek and forehead. The screens are placed on the outside of the cable bow temples, to insure cleanliness in the screw joint and eliminate the danger of the bows breaking at the joints. These temples are found to rest easily about the ears and to hold the glasses securely in place.

The glass used for the lenses is ground and polished on both sides. A simple screw joint is employed to hold the lenses in place, so that broken ones can be readily removed and replaced, this feature resulting in a saving to plants, as it is possible for them to make their own repairs.

The Erie City Iron Works, Erie, Pa., has taken an order for three 20 x 24-in. direct-connected Lentz single-cylinder, non-condensing engines, to be installed in the plant that is being erected by the Hill Publishing Company in New York City. The Cleveland office of the same manufacturer has just taken an order from the Standard Oil Company for two high speed 80-hp. engines, and recently secured an order for a 180-hp. engine and boiler for an electric light plant in Beach City, Ohio.

Tests of Grinding Wheel Protection Devices

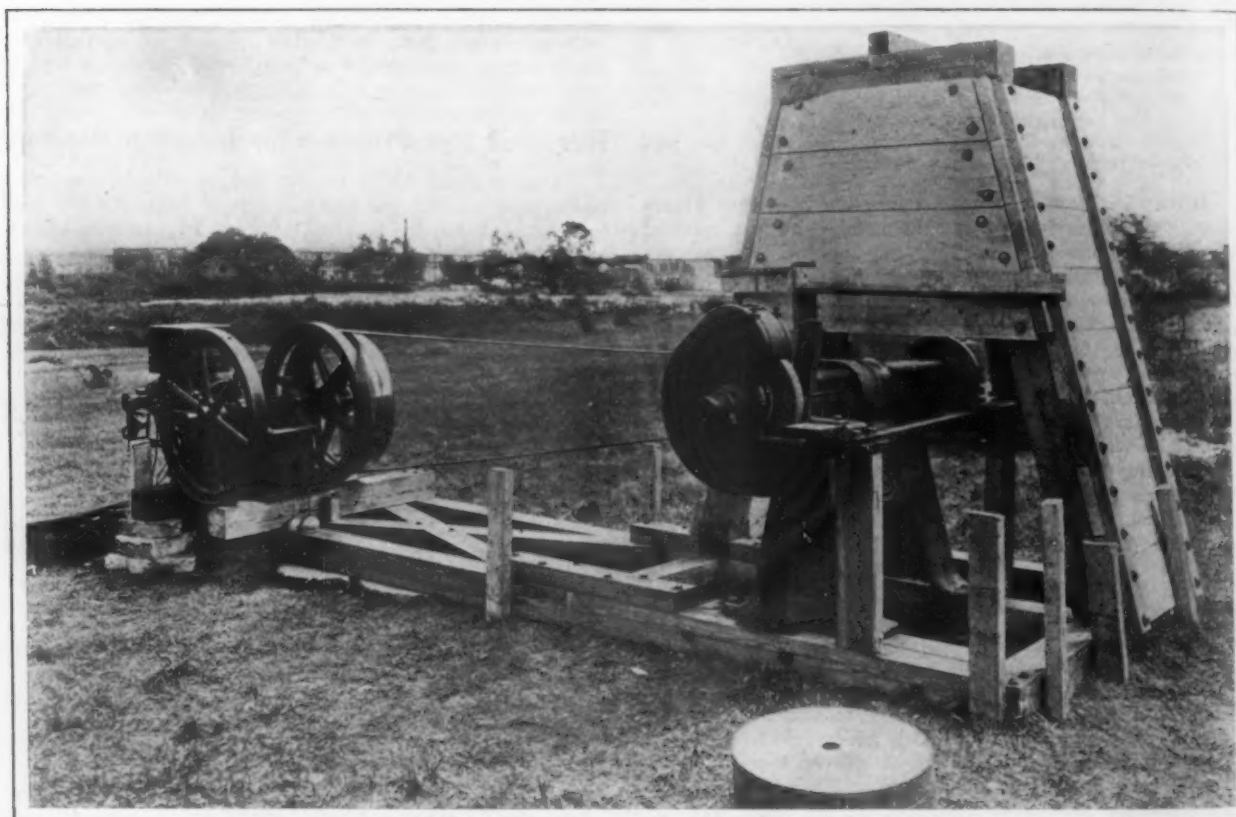
A Protecting Hood Shown Safer than Bevel Steel Flanges—An Investigation by the Research Laboratories of the Norton Company

—BY R. G. WILLIAMS*

Recent discussions in the technical press and publications devoted to industrial safety and welfare work have forcibly brought to the attention of those most interested the fact that there is no uniformity or standardization of grinding wheel protection devices. This lack of uniformity has been a serious handicap in the development of safer manufacturing conditions. Attention has also been drawn to the fact that there were no recorded data or observations on which standardization and safety rules could be

The wheels in the hood tests were broken by dropping a steel wedge between the rest and the side of the wheel in such a manner as to provide a severe blow. The object was to duplicate as near as possible one of the most frequent causes of accident, that of the work being caught between the rest and the wheel.

Flange Tests—The wheels used in the flange tests were all $24 \times 2\frac{1}{2} \times 1\frac{3}{4}$ in. Alundum vitrified grain 14, grade O, tapered both sides, $\frac{3}{4}$ in. to the foot, with a flat at the



The Equipment for Testing the Grinding Wheels Included a $1\frac{3}{4}$ -In. Norton Stand Driven at a Peripheral Speed of 6000 Ft. per Minute from a $7\frac{1}{2}$ -Hp. Gasoline Engine

based. With the purpose of obtaining data and observations on the relative protection offered by an approved type of protection hood and approved beveled steel flanges, the Norton Company, through its research laboratories, conducted a series of tests.

The testing equipment consisted of an up-to-date grinding wheel stand driven by a $7\frac{1}{2}$ -hp. gasoline engine. A wooden framework of heavy timbers was built over the side on which the flanges were tested, to intercept pieces of the wheels which might possibly break off outside the flanges. In all the tests the wheels were operated at 6000 ft. per min., peripheral speed, the speed being very carefully regulated immediately before each test.

Hood Tests—The wheels used for the hood tests were $16 \times 2 \times 1\frac{3}{4}$ in. Aluminum vitrified, of various grains and grades, and had parallel sides. The hood was of modern type, and the wheels were mounted between relieved 8-in. diameter cast-iron flanges. One layer of blotting paper of standard thickness was used between the wheel and each flange. The nut on the spindle was not tightened excessively, but drawn up enough to hold the wheel firmly.

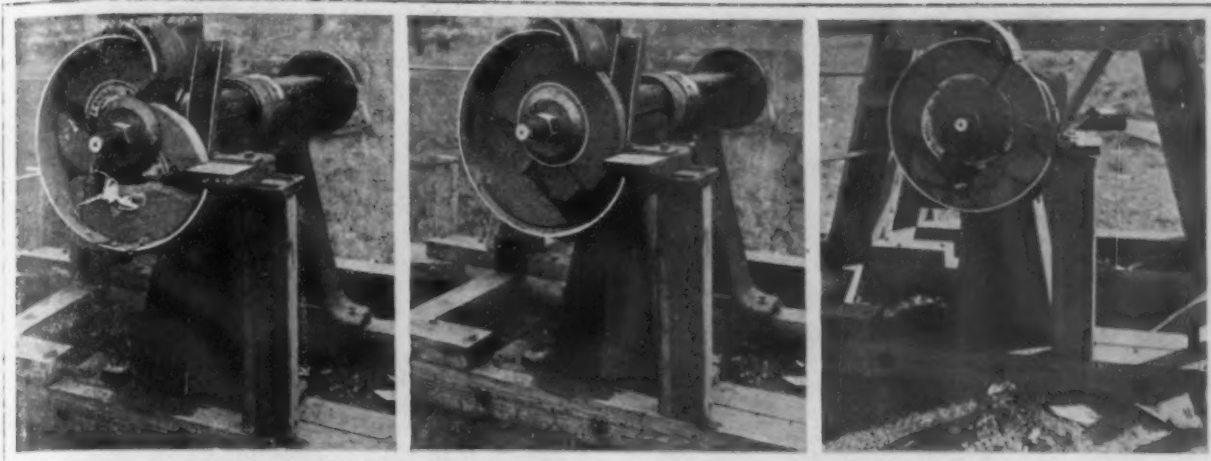
*In charge of mechanical testing laboratory, Norton Company, Worcester. Mr. Williams's contribution is a paper read before a local meeting of the American Society of Mechanical Engineers, New Haven, November 21.

center of 4 in. diameter. One thickness of standard blotting paper was used between the wheel and each flange. In these tests, five sets of relieved steel flanges tapered $\frac{3}{4}$ in. to the foot were used, of 12, 14, 16, 18 and 20 in. diameter.

The wheels in these tests were broken by swinging a 130-lb. cast-iron weight against the side of the wheel. This method of breakage corresponds to a common cause of accident when heavy castings, which are suspended by tackle above the wheel, are carelessly allowed to strike the side of the wheel with enough force to cause breakage. (The manner in which a wheel is broken is not important when protection devices for grinding wheels are being studied, so even though the wheels were broken by different methods in the hood tests and the flange tests, the results obtained are comparative from the point of view of protection to an operator.)

The Proved Value of the Protecting Hood

In none of the hood tests did a piece of the wheel leave the hood in a way that could have caused damage. The tests show conclusively that a well-designed protection hood, made of the right material, and properly adjusted, affords ample protection for straight side wheels even



Three of the Tests, Showing that None of the Broken Pieces Escaped from the Hood. The Wheel at the Left was a 16x2x1 3/4-In. Alundum 30-K Silicate; the Wheel in the Middle was a 16x2x1 3/4-In. Alundum 24-K Vitrified; the View at the Right Shows Two 18x1 1/2x-1 3/4-In. Alundum 20-O Vitrified

Wheels, Mounted at the Same Time and Separated by Three Blotters. After Various Attempts to Break These Two by Dropping Nuts, Bolts, Wedges, Etc., Between the Rest and the Face, Breakage Was Finally Caused by Dropping a Wedge Between the Rest and the Side of the Wheel

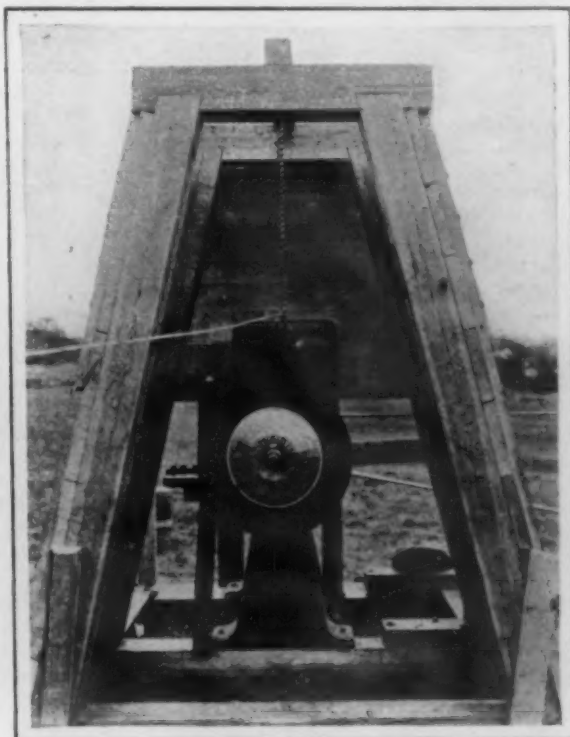
when they are mounted between standard straight relieved flanges one-half the diameter of the wheel.

It is possible to break pieces from a wheel by a severe blow when there is only 2 in. of the wheel projecting beyond the flanges. With protection flanges, no matter how little the wheel projects beyond the flanges, an operator has no protection from injury in case a piece of the wheel breaks off outside of the flanges, whereas with a hood, protection is almost absolute.

It was not the intention to obtain data from which standard specifications for hoods and flanges could be drawn; nevertheless, the tests as a whole brought out a number of points which could be so used.

The Design of Safety Hoods and Flanges

If specifications for hoods for rough grinding are drawn, they should not only require a certain strength as determined by the design and

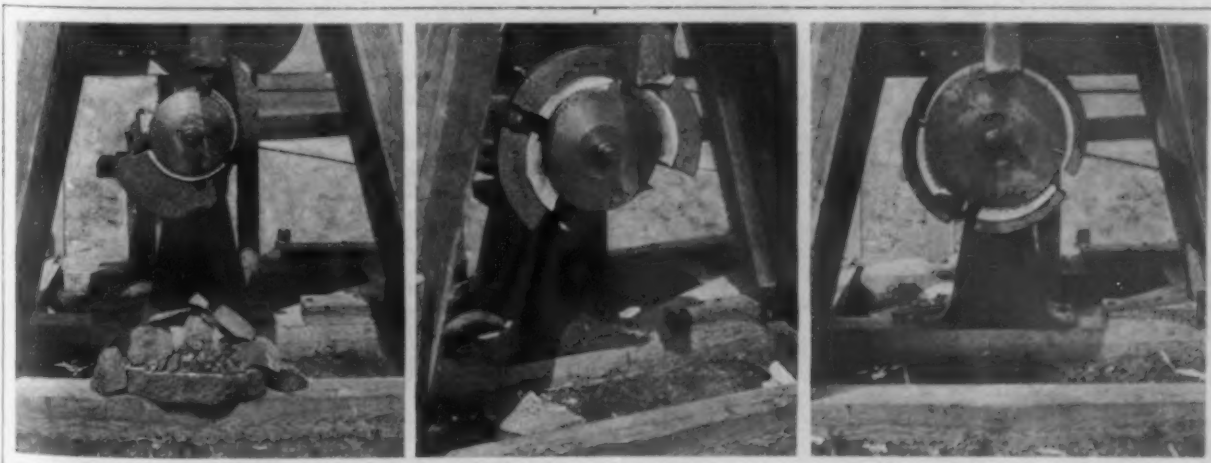


The Wheels Were Broken in the Flange Tests by Swinging a Cast-Iron Weight Weighing 130 Lb. Against the Side of Wheel. This Method of Breakage Corresponds to a Common Cause of Accident in Grinding Heavy Castings Where the Casting, Suspended by Tackle Above the Wheel While Being Ground, Comes in Violent Contact with the Wheel When Carelessly Handled

material used, but they should also require that the top end of hoods have some sliding-tongue device, which can be adjusted as the grinding wheel wears, and thus offer at all times the maximum protection possible. They should also contain a definite statement as to the maximum exposed grinding surface allowable for the common varieties of grinding. For example: Can 60 deg., 70 deg. or 80 deg. of grinding surface be exposed on the type of machine known as the floor stand? Such specifications should also state the minimum size wheel allowable in a hood of given dimensions.

In a majority of instances where protection flanges are now used, ample protection can be obtained by means of hoods without such flanges. However, there are conditions where a hood is not practical and where flanges offer the next best method of protection.

The amount of protection offered by flanges is dependent upon the following:



Tests of 24x2 1/2x1 3/4-In. Alundum 14-O Vitrified Wheels: That at the Left with 12-In. Steel Flanges, that in the Middle with 16-In. Flanges and that at the Right with 20-In. Flanges, all Relieved 3/4 In. to the Foot. In the Case of the Smallest Flange Shown, the Wheel Broke Into 42 Pieces of Various Sizes and About Two-thirds of the Wheel Escaped from the Flanges. In the Case of the Largest Size Flange Shown, the Segments were all Retained. In the Other Case Shown, the Piece on the Ground was Not the One Which Received the Blow

A—The capability of the flanges to resist wedging action of a broken piece of the wheel.

B—The size of the flanges.

C—Bevel of the wheel.

D—Peripheral velocity of the wheel.

E—Mass of the wheel.

F—Degree of safety. The term degree of safety, as here used, expresses the relationship between the thickness of the wheel at the hub and the thickness of the wheel at the point where the outer edge of the flanges bear on the wheel. In other words, it is an expression which indicates how much the flanges must spread in order to let out a broken sector of the wheel.

If the force with which a sector tends to come out of protection flanges is great enough to spread the flanges a distance equal to B—A of the sketch of the wheel, then a sufficient amount of protection is not present. Sufficient protection can be obtained by (a) increasing the thickness of the flanges, (b) using flanges of a material with a greater modulus of elasticity, (c) increasing the diameter of the flanges, or (d) increasing the taper per foot of the wheel.

Some figures obtained from the 16-in. diameter flange test give a basis on which standard specifications may be formulated. The combination of factors present in this case resulted in what could be termed a critical condition. The wheel broke into four almost equal pieces, the weights of which were about 23½ lb. The peripheral velocity of the wheel was 6000 ft. per minute. The wheel was tapered ¾ in. to the foot, the taper ending 2 in. from the center of the wheel. In order for a sector to fly out of the 16-in. diameter flanges, the flanges had to spread a total of ¾ in. After the breakage, it was found that the sectors had moved out a little over 5½ in. and the flanges had spread a little over 11/16 in., or nearly the required distance to let out the sectors. (To illustrate the author's "degree of safety," the accompanying cut is presented.)

The shape of the flanges used was such that it has been found impractical to consider them as cantilevers of the same cross-sectional area, and therefore, the acting forces in the above case and the exact factor of safety cannot be readily calculated. For this reason we cannot deduce definite formula relations between the several factors involved. When further tests are conducted, flanges will be used of a shape which will allow such calculations. We can, however, find a proportional relation which expresses the relative degree of safety with different size wheels and flanges.

The 20-in. diameter flanges must open 1 in. to let out a sector. This distance is 33⅓ per cent. more than in the case cited above, so that 20-in. flanges of the same stiffness as the 16-in. flanges would just about hold the quarter

sector of a wheel of 33⅓ per cent. greater mass. A 24-in. wheel of 33⅓ per cent. more mass than the 2½ x 24-in. wheel cited above would be a wheel about 3⅓ x 24 in.

Since 20-in. flanges are as large as is practical to use on wheels 24 in. in diameter, it is quite obvious that 24-in. wheels of a thickness greater than 3½ in. are not safely guarded by means of ¾-in. taper protection flanges, unless the flanges are made more rigid than most of the existing types of flanges. Standard specifications should require a factor of safety of at least 2. This requires a greater taper than ¾ in. to the foot, or the use of very heavy steel flanges.

Conclusions

The tests conducted and the mathematical deductions given show that protection hoods provide greater safety than do safety flanges.

The protection offered by any given taper decreases with decreased diameter of the wheel. To provide equal safety on all sizes of wheels would require, therefore, a graduated difference in taper.

A hood with an adjustable tongue furnishes equal protection for a wide range in the diameter of wheel.

Second to safety, the cost of operating a given grinding machine is of vital interest. In this respect adjustable hoods have the better of the argument, for, as the wheel wears, protection flanges must be changed frequently. Such change involves the removal and remounting of the two flanges and wheel, whereas in the case of a hood the change would merely involve set screw adjustment.

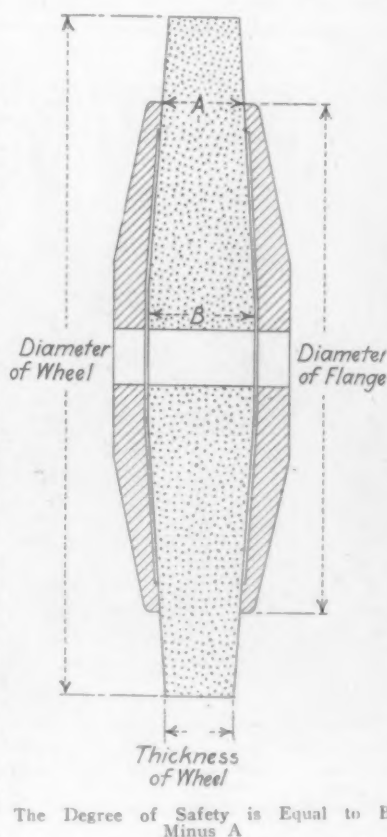
To provide adequate protection for wheels 3 in. and thicker, the thickness (hence the weight) of flanges would have to be increased beyond those of any flange now on the market. This would mean added momentum to the revolving spindle, which in turn would require greater rigidity and strength than is to be found in the large majority of present day grinding machines.

Since the face of a tapered wheel becomes wider as the diameter increases, serious inconvenience is caused in all grinding where the wheel must work in a slot.

Tapered wheels do not permit the grinding of right angle shoulders as do straight wheels.

Laws in most every country require the removal of dust from grinding. This requires the use of a hood, and if a hood must be used, it might just as well be strong enough to offer protection in case of accident.

A proper hood offers complete protection. Protection flanges can not offer this complete protection, but in instances where a hood would interfere with the proper use of the wheel, flanges offer the next best method of protection.



The Degree of Safety is Equal to B Minus A

The Proposed Advances in Freight Rates

WASHINGTON, D. C., December 2, 1913.—It has developed that the railroads operating east of the Mississippi River and north of the Ohio and Potomac Rivers, who are petitioning the Interstate Commerce Commission for an increase in freight rates, and who opened their case before the commission last week, propose increases that are in excess of 5 per cent., and which will bear heaviest on the iron, steel and coal trades. In their petition the carriers state that the tariffs filed show an increase of 5 per cent., but during the hearing attorneys representing the carriers admitted that in every case where the rate is less than \$1 a ton it has been increased 5c. per ton and not 5 per cent. Thus, the rate on iron ore from Lake Erie to the Pittsburgh district, which is now 88c. a ton, is to be increased to 93c.

The Pittsburgh Coal Company has filed a protest

against this particular system of increasing rates, and the indications are that many other bituminous coal companies will be heard in protest when the railroads have finished the presentation of their case. Rates on anthracite coal are left unchanged. The hearing is to be resumed December 10. Attorneys representing coal, iron and steel companies estimate that if the commission permits the increase as asked for by the carriers the Pittsburgh district will contribute about \$20,000,000 of the \$60,000,000 additional revenue which the carriers estimate will result from the proposed increases.

W. L. C.

The Chicago & Northwestern Railway is making surveys for a proposed spur track from Baraboo, Wis., south to the Cahoon iron mine, which is preparing to begin to ship ore about March 1.

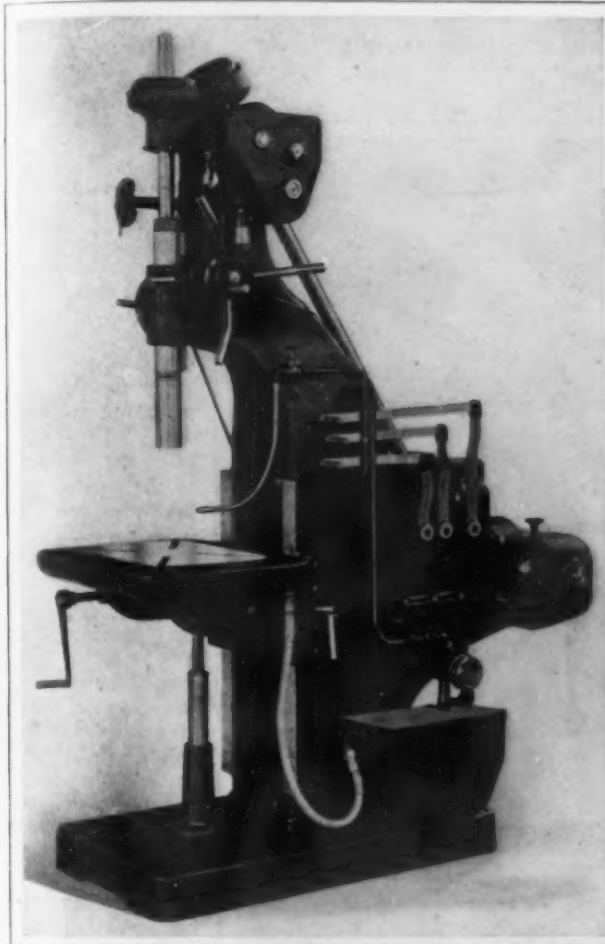
A 22-In. All-Geared Drilling Machine

A Heavy Duty Rapid Production Manufacturing Tool Having Self-Lubricating Bearings

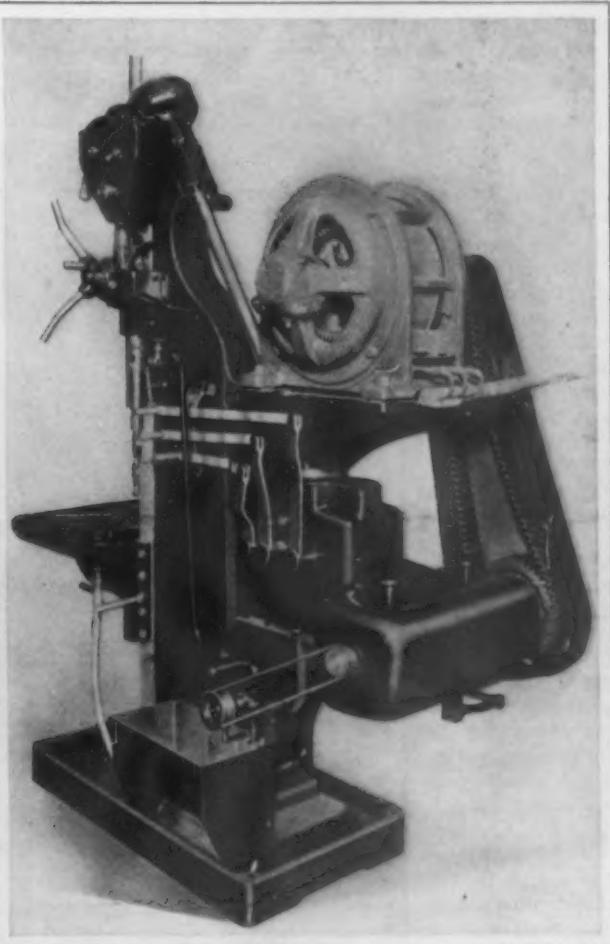
A manufacturing drilling machine, built for heavy work and rapid production, having every bearing except the spindle sleeve self-lubricating, has been placed on the market by the Barnes Drill Company, Rockford, Ill. There are eight geared speed changes and ten geared feeds provided, all of which are instantly controlled by the operator from the front of the machine. The machine is designed to handle high-speed twist drills, ranging from $\frac{1}{8}$ to 2 in.

type and the changes are secured by the manipulation of levers in front of the operator, the rates which vary from 0.003 to 0.093 in. per revolution of the spindle being plainly indicated on an index dial plate. All of the important feed gears are cut from steel and are case hardened. A safety collar protects the machine against damage from overloading.

The over-all height of the machine is 85 in. and the floor space occupied is 31 in. wide and 65 in. deep. The distance from the center of the spindle to the face of the column is 11 in. The table, which is of the ordinary type, has a working surface of 14 x 20 in. and a vertical travel



Operating Side



Driving Side

TWO VIEWS OF A RECENTLY DEVELOPED 22-IN. SELF-OILING ALL GEARED DRILLING MACHINE

in diameter, at the speeds and feeds which are considered good practice for work in steel.

With the exception of the spindle sleeve and the cross spindles, all the bearings are lubricated automatically. A geared pump in the reservoir of the machine supplies the oil, which is distributed continually to all the gears and bearings, including the crown gears and feed box. This self-oiling system has been applied to the machine under a license from the Kearney & Trecker Company, which owns the patents covering it.

All the transmission gears, including the crown gear and the pinions, are cut from steel and heat treated, with the exception of the friction clutch gears. Levers within easy reach of the operator from his position at the front of the machine provide eight changes of speed. There are four steps in this series, ranging from 233 to 575 r.p.m., with a driving pulley speed of 500 r.p.m. By engaging the back gears, four additional speeds ranging from 58 to 144 r.p.m. are made available. The spindle, which has a travel of 14 in., can be stopped by placing the shifter lever in the neutral position or by disengaging the clutch gear. It is provided with either a No. 4 or No. 5 Morse taper, as may be preferred, and is $1\frac{3}{4}$ in. in diameter at the driving end and $2\frac{11}{16}$ in. in diameter at the nose. The spindle is mounted in a sleeve, which is $2\frac{3}{4}$ in. in diameter, and has a steel rack $1\frac{1}{4}$ in. wide, cut in it.

Like the speed changes, the feeds are of the all-geared

of 23 in. The net weight of the machine, with the regular table and the oil pump attachment is 2620 lb. If desired, the machine can be fitted with an electric motor and a silent chain drive, as illustrated at the right of the accompanying engraving.

Stove Founders' and Molders' Conference.—The annual conference between representatives of the Iron Molders' Union of North America and the Stove Founders' National Defense Association will be held in December at Atlantic City, on a date soon to be announced. At the time of the recent convention of the National Founders' Association in New York there was an informal meeting of a number of stove manufacturers to discuss the situation. Business conditions do not warrant wage advances, yet it is understood the iron molders are proposing a \$4 minimum.

Under the auspices of the National Council for Industrial Safety, the temporary organization of the Chicago branch, known as the Chicago Council for Industrial Safety, has been effected. Officers chosen were: President, Dr. A. M. Harvey, Crane Company; secretary, Samuel A. Harper. A draft of proposed by-laws was submitted to the members to be subsequently ratified in connection with the permanent organization.

A Power Plant of Small Proportions

Sullivan Angle Compound Compressor
An Aid Where Space Was Limited

In the building and equipment of a power house under conditions which necessitated the close utilization of space, the engineers of the Reading-Bayonne Steel Casting Company have presented an excellent example of what can be accomplished in crowded quarters. In the portion of the company's grounds at Bayonne, N. J., where it was desired to locate the power plant, there were three restrictions in the way of building a structure of generous proportions. On one side was a public street, on another railroad tracks which run through the yard and into the plant, while another hindrance was an oil tank 60 ft. in length imbedded in the earth at a place which the building logically might have covered.

It was therefore determined to erect on the ground available a concrete block structure 14 x 26 ft., one story in height and of the simplest construction. In this small building, which affords only about one-third the room previously used for power purposes in one of the main buildings, was placed a Sullivan 16 x 9 3/4 x 12-in. angle compound air compressor with a capacity of 628 cu. ft. displacement at 225 r.p.m., a 60-hp. motor furnishing power for the compressor, a combined motor generator set consisting of a Crocker-Wheeler generator and a C & C generator, direct connected at opposite ends of a Crocker-Wheeler motor, and a switchboard. From the plant is obtained 70-volt direct current, for welding; 230-volt direct current for crane service;

compressed air, and through the switchboard passes alternating current of 230 volts for miscellaneous purposes, which is supplied by the Public Service Corporation of New Jersey. On the roof of the building is a set of transformers. Should it be required, there is still room for another air compressor of similar type to the one installed.

W. D. Sargent, chairman of the board of directors of the Reading-Bayonne Steel Casting Company, holds to the belief, as do many others, that foundry operators should get away from the problems of the power plant. In discussing the manner in which his own company had eliminated the question to a very great degree, he said that the need of enlarging the power plant as the foundry grows should be a minor question, and that it would be if more dependence was had on the public service corporations which invariably are willing to cooperate in solving the question of power. The increasing use of machinery in foundries, he pointed out, means increasing need of power and this can be supplied with the greatest degree of flexibility by outside plants. This dependence also insures the benefits to be derived from the frequent improvements which are made in electrical machinery and

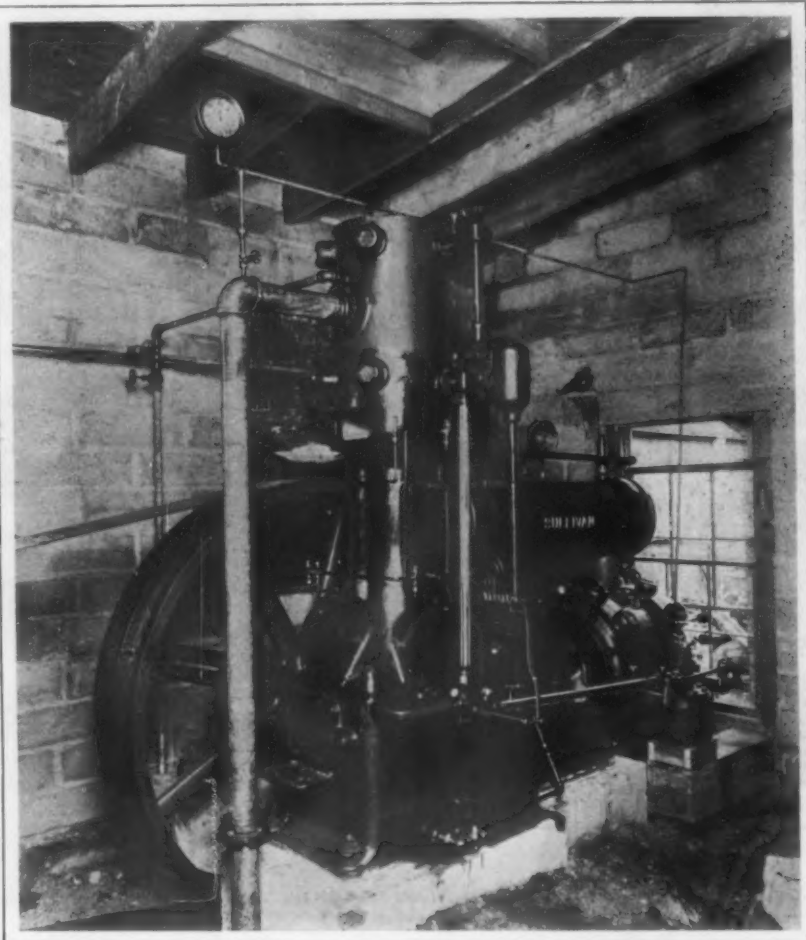
methods. Obsolescence in the power plant should never confront the steel foundry, Mr. Sargent declared. His view, of course, cannot apply to isolated plants which do not have access to a large public source of power.

The angle compound compressor installed at the Bayonne plant is one recently brought out by the Sullivan Machinery Company, Chicago. Its economy of floor space made it of peculiar applicability, as may be observed from the accompanying half-tone. The compressor, driven by a 60-hp. motor is giving the service previously rendered by two compressors, one of which was driven by a 60-hp. motor and the other by a 50-hp. motor. It is operated practically night and day. The illustration, which was taken before the floor was completed, shows how the machine was placed in a corner of the power house with only a narrow passageway around it, a setting which was made possible by placing a window in the side of the

building much lower than it would be ordinarily and directly opposite the low pressure cylinder head and the inter-cooler, just above it. The removal of the head or access to the intercooler can thus be facilitated by the removal of the window. To facilitate the removal of the head of the high-pressure cylinder a skylight was placed directly over it.

Some details of the machine, as stated in the specifications of the Sullivan Machinery Company, follow: As already indicated, the compressor is constructed with one high pressure and one low pressure cylinder, the latter located in a horizontal and the former in a vertical plane. The main or horizontal frame to which the low pressure cylinder is directly attached is a massive casting supporting the entire machine. A heavy frame or pedestal supporting the high pressure cylinder rests upon the main frame. A single crank pin drives both low and high pressure pistons. All moving parts except the valve gear are provided with positive automatic lubrication and are entirely enclosed within the frame. The main or low pressure frame is of the Tangye type, strongly ribbed with bored guides for the low pressure cross head and planned jaws for the reception of the crank shaft boxes. It has oil tight removable covers on either side over openings which are provided for access to the cross head and a solid bottom designed to form a reservoir for oil. The pedestal supporting the high pressure cylinder is similarly bored. It also has openings on either side to afford access to the cross head.

Both low and high pressure cylinders are made with separate liners forced into the main castings, the spaces between the liners and the cylinder castings forming the water jackets. The air passages in the cylinder castings cover the entire area outside of the jackets, the inlet and discharge sides being separated by longitudinal partitions on the sides of the cylinders. The surface on the



How with a Skylight Above and a Window at the End an Angle Compound Compressor Was Acceptably Placed in a Corner of the Power Plant of the Reading-Bayonne Steel Casting Company

outer side of the jacket walls provides considerable cooling area in addition to that of the intercooler.

The intercooling surface consists of a nest of aluminum tubes, through which the cooling water circulates, entering at one end, traversing one-half the tubes, and returning through the remainder. The ends of the tubes are expanded into two headers, the outer header being bolted against a packed joint on the outer end of the intercooler body, while the other header, inside the intercooler body, is left free to move with the expansion or contraction of the tubes.

An Automatic Nut Tapping Machine

An automatic nut tapping machine, having a stationary tap and a belt conveyor for feeding the nut blanks to the tap spindle, has been developed by the Erie Machine Shops, Thirteenth and Peach street, Erie, Pa. This machine is designed for handling $\frac{3}{4}$ -in. hexagon or square nuts and a number of safety devices have been provided.

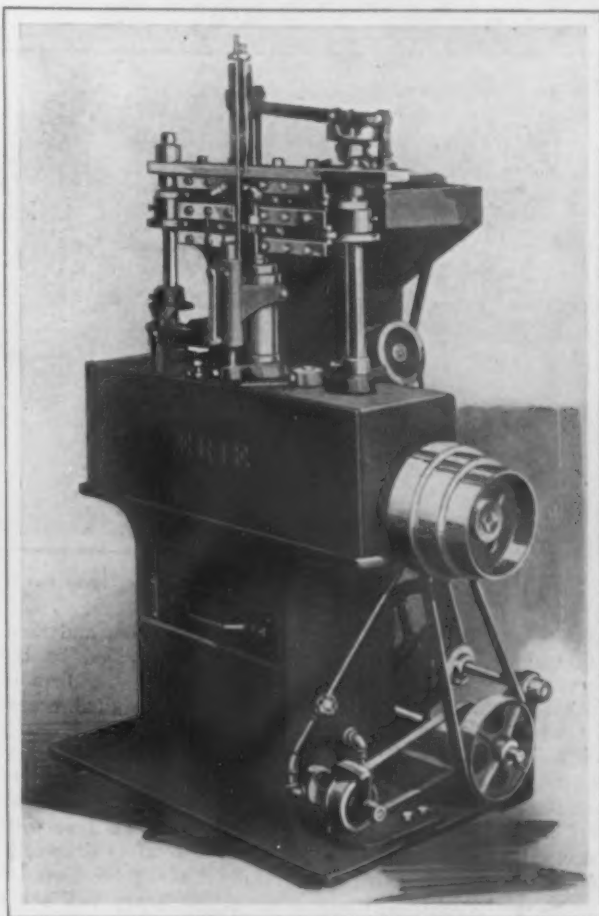
The nut passes on the blank or shank end of the tap, then over the threaded part and finally drops through a hollow shaft in the drip pan below. If the hole in the nut is too small, it cannot, of course, pass over the shank of the tap. The feed is a belt traveling over the top and edge of the hopper at an angle of 15 deg. The nuts are lifted from the hopper and dropped upon the belt, sufficient room being provided for those that do not land flat, either to right themselves or to be pushed back into the hopper. The blanks are carried along on the belt until the foremost one is directly over the top and blank end of the tap, where it rests on a pair of hinged plates held in place by two small balance weights. Here it remains until the starter, operated by the arm or lever from the cam on the upper right vertical shaft, bears down upon it, opening the plates and allowing the nut to pass down over the shank of the tap, either by gravitation or by the pressure of the starter, and through the top grips which open at this time. These grips open when raised above the containing casing. The top grips close and the bottom ones open and the starter continues to follow the nut to the chuck, which at this time rises and its grips are open to receive the blank. The chuck has a hole through its length, the shape of the nut to be tapped, but a trifle larger. As soon as the nut is gripped in the chuck the top grips close and the blank is carried down until there are enough threads in the nut to relieve the tap of its heavy duty. At this time the chuck rises to grip another blank, its length being sufficient to continue to drive the nut that is being finished. The number of threads the nut passes over on the tap before another blank is accepted, depends upon the class of work that is being done, but 22 or 23 threads are considered the proper number for machine screw nuts. In the machine illustrated in the accompanying engraving, the nut makes 22.2 revolutions before the next blank starts on the tap. It is possible to finish six $\frac{3}{4}$ -in. cold pressed hexagon machine screw nuts in 1 min., the speed being only governed by what the tap will stand.

The chuck driver is operated by a driver and cam on the lower left shaft and attached to it is a small connecting rod operating a latch that holds the starter in its extreme upper position. This rod trips the latch only after the driver has started down with the chuck and if this should not happen, the starter ceases to operate, thus avoiding the filling of the shank of the tap with blank nuts.

The main or pulley shaft runs horizontally throughout the length of the machine and drives a parallel shaft by a pair of spur gears. These gears are conveniently located for changing as the amount of thread tapped in one nut before feeding in another depends upon the relative speed of these two shafts since the hollow vertical chuck shaft is driven from the second shaft through a mitre gear connection. Power is transmitted from the main or pulley shaft to the two vertical camshafts through worms and worm gears. As nuts that do not have a full thread do not have to travel as far along the tap before the next blank is picked up, it is possible to increase the output of the machine without changing the spindle or nut speed on the tap.

The tap is held in position by two pairs of grips, which are of tool steel, secured to the inner end of machinery

steel guides with an adjusting screw behind them to centralize the tap and adjust it to suit the different sizes. The outer end of the guides or grip holders are tool



A New Automatic Nut Tapping Machine Having a Belt Conveyor for Supplying the Blanks to the Tap Spindle

steel rolls which bear on and are operated by tool steel cams, mounted on the vertical shaft. There are no levers, reliance being placed upon the cam which is located directly behind the grips to insure absolute rigidity of the tap.

Another safety precaution is provided to prevent the nut with a ragged hole from causing damage. In the right worm and worm gear driving the vertical cam shaft, the thrust comes on the pulley end of the driving shaft, to which the pulley is secured by a short feather key. On the end of the shaft is a thrust collar, which as pointed out, is strong enough to operate the vertical shaft, but which would break when a nut with a ragged hole lands on the shank of the tap between the grips as they close, thus stopping the two vertical shafts simultaneously and preventing the stripping of the gears. The main shaft is drawn out of the pulley by the worm screw until the feather key is entirely out of the pulley, thus permitting it to run idle. If such a mishap should occur, it is simply necessary to push the shaft back into place and put on a new thrust collar.

Among those who have recently placed orders for Conoidal multiblade fans with the Buffalo Forge Company, Buffalo, N. Y., are the Edison Illuminating Company, Detroit; Ford Motor Company, Detroit; Pontchartrain Hotel, Detroit; Lord & Taylor Building, New York; Masten Park High School, Buffalo; Stevens Building, Portland, Ore.; Princess and United States theaters, Denver; Trumbull Steel Company, Warren, Ohio; Western Maryland Railroad, Hagerstown, Maryland; First National Bank, El Paso, Texas, and American Sheet & Tin Plate Company, Pittsburgh.

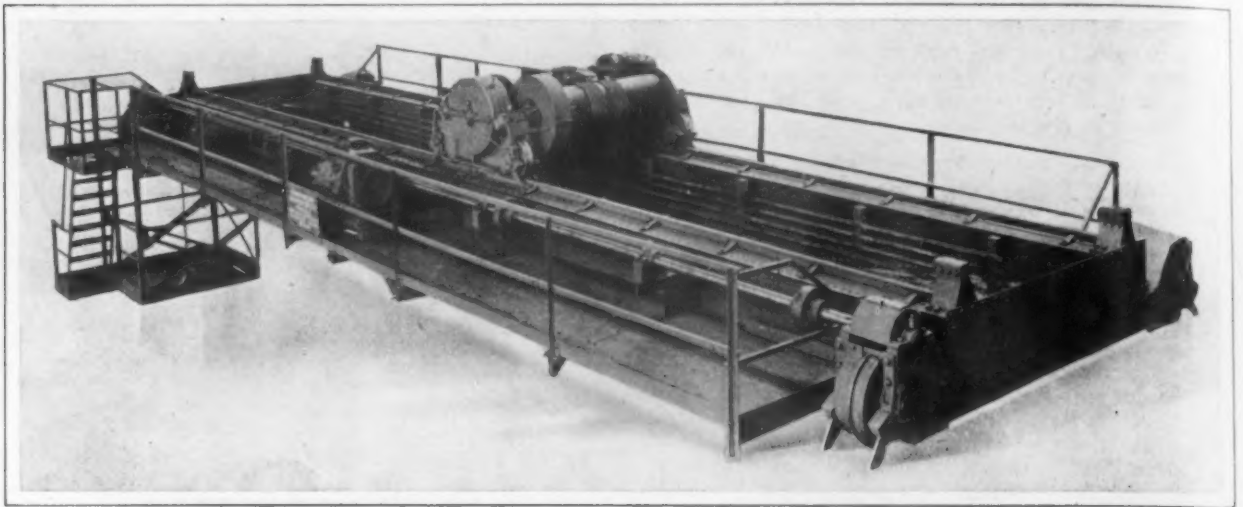
The Baxter Frick Gear Cutting & Mfg. Company, recently organized by A. H. Baxter, W. H. Frick and others, has established a plant at 5211 Windsor avenue, Cleveland, Ohio.

A Heavy Duty 10-Ton Steel Mill Crane

The Northern Engineering Works, Detroit, Mich., has recently brought out a mill crane possessing a number of interesting features. It is built to conform to the standard

Rockford Machine Tool Company Expands

The Mechanics Machine Company, Rockford, Ill., has sold its entire drill-press business, including all patterns, jigs, special tools, etc., to the Rockford Machine Tool



A 10-Ton Mill Crane Designed for Heavy Service and Equipped with a Number of Safety Features

safety specifications of the Association of Iron and Steel Electrical Engineers, supplemented and modified by the special specifications of the mill of a large steel firm in Pittsburgh district, which purchased the original crane.

The crane is designed for heavy service and has a capacity of 10 tons. It is of steel construction, steel castings being used extensively. The bridge footwalks are of steel with checkered plates and the bridge and trucks are heavy steel castings, the latter of the MCB type with safety guards in front of the wheels and safety drop lugs under the trucks. The trolley is built along the lines of the builder's type E design adapted for heavy mill service, and has a frame and connecting girt of steel castings. The intermediate reduction gearing connecting the back geared motor with the drum gear is in a pocket cast into the trolley side. When especially high-speed designs are used the motor back gear is used as the only intermediate one, thus giving a two-reduction design.

Motors of the mill type are used and the bridge is equipped with bar conductors, all the wiring being run in steel conduits. The trolley wheels have guards in front of them and the bearings are of the capped type, with split bronze bushings. The trolley axle bearings are of the MCB type with steel waste pockets. A safety pan is located underneath the entire trolley.

The cage is of extra large size with an outside steel staircase leading to the footwalk. There are no overhanging or exposed gears on the whole crane. An automatic limit stop for the hook, automatic electric brakes and a dynamic brake are among the features of the crane.

Engineers who keep a file of books for reference will be interested to know that the Joseph Dixon Crucible Company, Jersey City, N. J., still has a limited number of booklets dealing with such subjects as "Steam Traps," "Unions for Steam Pipes," "Feeding Graphite for Lubricating Purposes," etc., which will be sent free as long as the supply lasts. These treatises were prepared by the well-known engineer, W. H. Wakeman, who has written many articles on practical engineering problems. Numerous illustrations are used to make each subject easily understood. They were printed some time ago, but are just as desirable as ever.

The Toronto branch of the Canadian H. W. Johns-Manville Company, Ltd., has removed to more spacious quarters at 19 Front street, East. The new store and warehouse is situated in the heart of the wholesale district, has a floor area of approximately 35,000 sq. ft., and will give ample space for the display of a complete line of asbestos roofings, packings, pipe coverings, etc. The entire building will be lighted by the Frink and J-M Linolite system of lighting and one room will be used for exhibiting these systems.

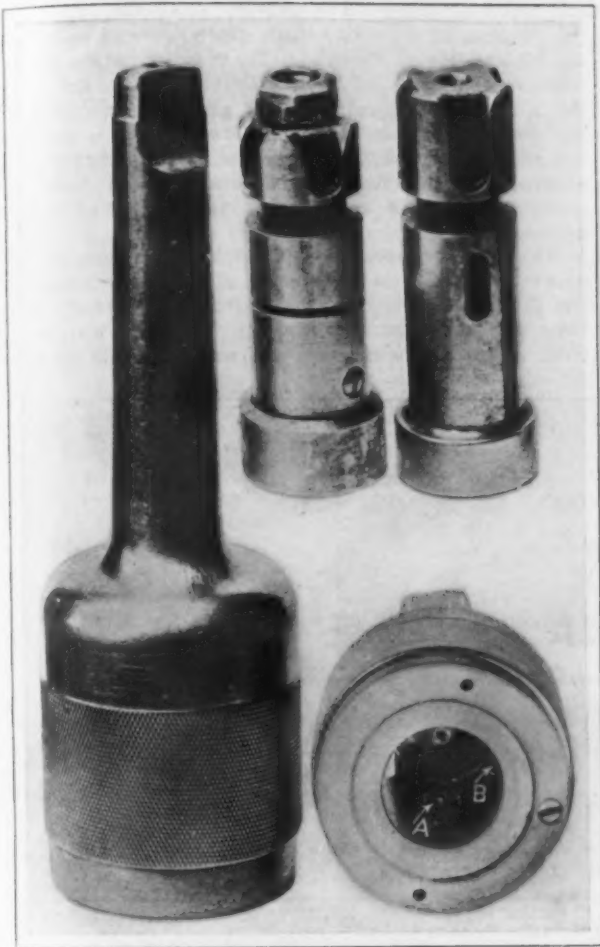
Company, which will hereafter also manufacture that line, continuing it under the established trade name of the Mechanics drill. Thee Mechanics Machine Company will devote its undivided attention hereafter to the manufacture of its automobile transmission. The Rockford Machine Tool Company is widely known in the trade in connection with the manufacture of planing, shaping and milling machines. Its business will be considerably expanded by the addition of an established drilling machine line. The company erected a fine modern fireproof plant in 1911, to which extensions will be made as the business warrants.

A New Type of Drill Chuck with Key Drive

The E. Horton & Sons Company, Windsor Locks, Conn., has developed an interesting type of drill chuck which can be furnished for handling all makes of drills and taps up to a maximum drill size of 2 in. and 1 1/4 in. U. S. standard taps. The drive is of the floating type on removable tool steel centers, two keys, A, 3/8 in. in diameter



View of the New Horton Drill Chuck in Use Showing the Variety of Tools that Can Be Handled



The Chuck and the Different Collets Supplied

being used, while the locking is accomplished by two $\frac{3}{8}$ -in. lugs, one of which is shown at B. The chuck can be supplied with either a No. 4 or No. 5 Morse taper shank and collets can be furnished which are bored to conform to No. 1, 2, 3 or 4 Morse taper, or for positive or friction drive taps.

The Improved Imperial Chain Hoist

The Franklin Moore Company, Winsted, Conn., has brought out an improved type of its Imperial chain block, which contains a number of new features tending toward

a large part of the loss by friction is eliminated by the use of hardened steel rollers for the bearings of the load shaft, and the rigid supports of the steel frame plates connecting the shaft and the top hook. Three steel disks or frame plates, in combination with the pressed steel casing, afford compactness and lightness. The two rear plates give very short center distances between the gearing, assisting to preserve perfect alignment, and the front and center plates give a short bearing for the load sprocket. Three long studs pass through the three plates, and with the separator bushings, lock the structure into a rigid unit, thus preventing the chance of twisting. The plates are very easy of removal, making the parts wholly accessible with little labor. The load chain guards run as rolls, insuring the free mesh of the load chain and sprocket.

A new and very important feature of this hoist is an automatic attachment for the control of the holding brake. It is in the form of an interior ratchet pinion mounted on a heavy stud near the outward end of which there is a slot to admit the floating pawl. The shape and location of the ratchet teeth are such that the pawl is automatically forced into place regardless of the speed at which the hoist is operated or its angle, and securely holds the load the instant the operator ceases pulling on the hand chain. It is a positive locking attachment, absolutely free from springs or frail parts. In lowering a slight reverse pull on the hand chain permits the load to descend smoothly, and under absolute control.

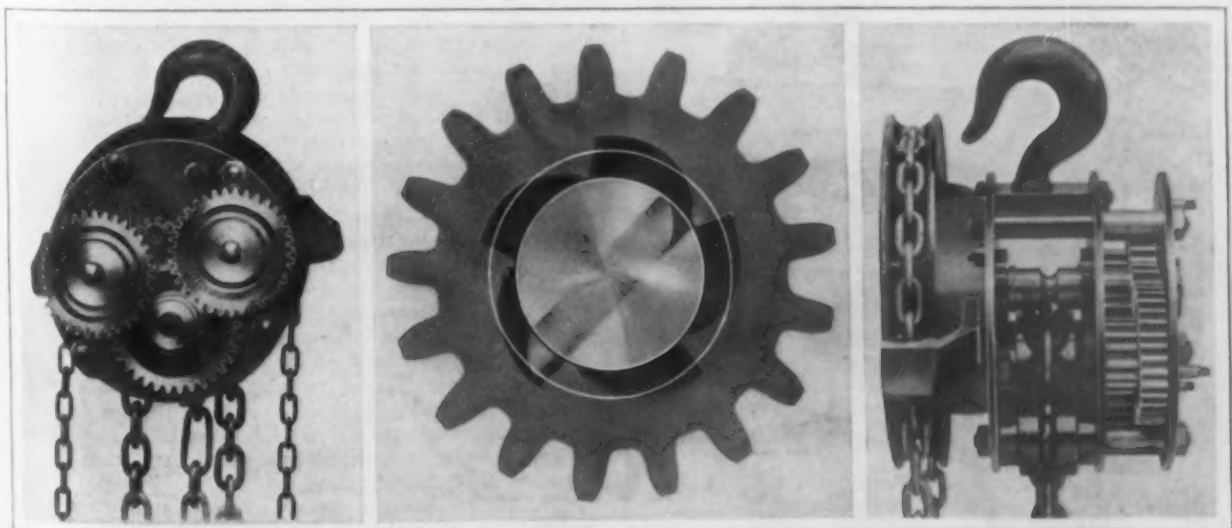
The chain block is made in the standard sizes, for capacities of from $\frac{1}{2}$ to 20 tons.

Marking Packages for Transportation

The Boston Merchants' Association, in its Bulletin, has issued the following appeal at the request of transportation companies, in the effort to reduce the evils of illegible or improperly executed bills of lading, shipping orders, etc.

"The bill of lading or shipping ticket should be type-written when practicable, and when not should be written legibly in ink or indelible pencil. All abbreviations, wherever practicable, should be avoided. Name of consignee and destination should be shown in full. The number of packages and weight, routing where specific routing is desired, and prepayment where shipment is to be prepaid, should also be noted. Care should be taken to have articles described as provided for in the classification (avoiding trade names) as to the definite name of the article offered for transportation, and the character of the packages should be indicated.

"Packages should be marked to show plainly the consignee's name and destination in conformity with the bill of lading. As additional precaution for the recovery of goods, should they go astray or arrive at destination and



End View

Brake Control Pinion

Side View

THREE VIEWS OF A RECENTLY DEVELOPED CHAIN HOIST WITH A SOMEWHAT NOVEL BRAKE PINION

strength, compactness, ease of operation and accessibility for repairs. The general mechanical principles involved are unchanged from the former model. Smooth running results from the balanced train of spur gearing, while the rapid raising and lowering speed is due to the fact that

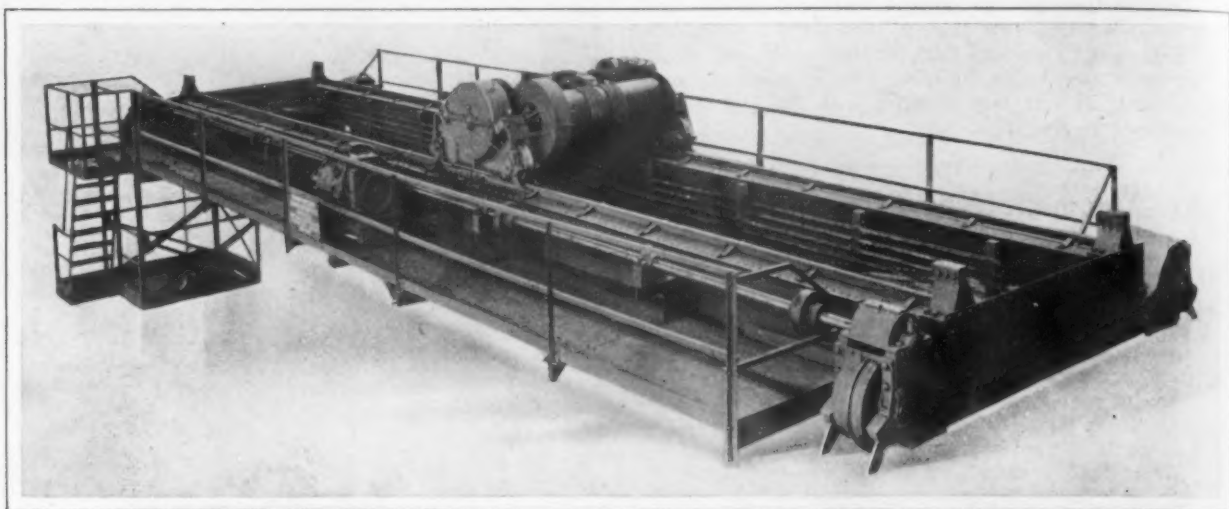
be uncalled for, the shipper's name and the point of shipment preceded by the word 'from' should be marked on each package. The proper marking of packages also aids in obtaining correct loading, prompt forwarding, and proper delivery."

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A 10-Ton Mill Crane Designed for Heavy Service and Equipped with a Number of Safety Features

safety specifications of the Association of Iron and Steel Electrical Engineers, supplemented and modified by the special specifications of the mill of a large steel firm in Pittsburgh district, which purchased the original crane.

The crane is designed for heavy service and has a capacity of 10 tons. It is of steel construction, steel castings being used extensively. The bridge footwalks are of steel with checkered plates and the bridge and trucks are heavy steel castings, the latter of the MCB type with safety guards in front of the wheels and safety drop lugs under the trucks. The trolley is built along the lines of the builder's type E design adapted for heavy mill service, and has a frame and connecting girt of steel castings. The intermediate reduction gearing connecting the back geared motor with the drum gear is in a pocket cast into the trolley side. When especially high-speed designs are used the motor back gear is used as the only intermediate one, thus giving a two-reduction design.

Motors of the mill type are used and the bridge is equipped with bar conductors, all the wiring being run in steel conduits. The trolley wheels have guards in front of them and the bearings are of the capped type, with split bronze bushings. The trolley axle bearings are of the MCB type with steel waste pockets. A safety pan is located underneath the entire trolley.

The cage is of extra large size with an outside steel staircase leading to the footwalk. There are no overhanging or exposed gears on the whole crane. An automatic limit stop for the hook, automatic electric brakes and a dynamic brake are among the features of the crane.

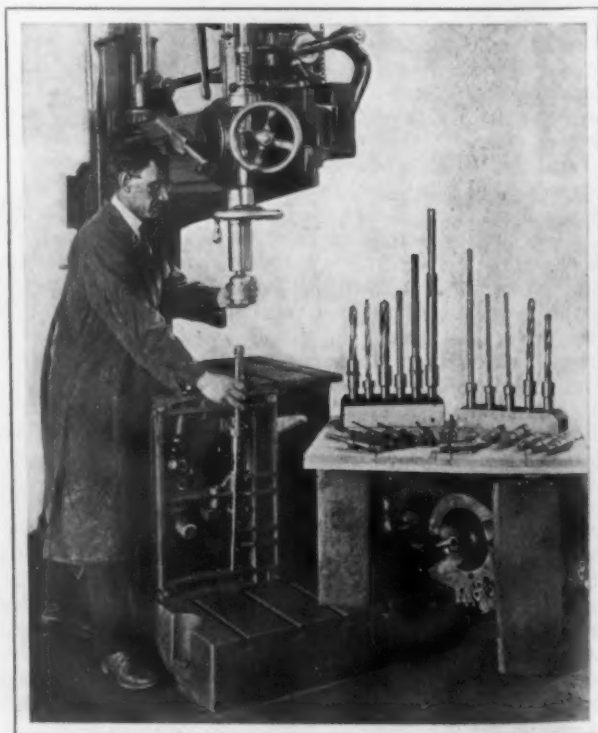
Engineers who keep a file of books for reference will be interested to know that the Joseph Dixon Crucible Company, Jersey City, N. J., still has a limited number of booklets dealing with such subjects as "Steam Traps," "Unions for Steam Pipes," "Feeding Graphite for Lubricating Purposes," etc., which will be sent free as long as the supply lasts. These treatises were prepared by the well-known engineer, W. H. Wakeman, who has written many articles on practical engineering problems. Numerous illustrations are used to make each subject easily understood. They were printed some time ago, but are just as desirable as ever.

The Toronto branch of the Canadian H. W. Johns-Manville Company, Ltd., has removed to more spacious quarters at 19 Front street, East. The new store and warehouse is situated in the heart of the wholesale district, has a floor area of approximately 35,000 sq. ft., and will give ample space for the display of a complete line of asbestos roofings, packings, pipe coverings, etc. The entire building will be lighted by the Frink and J-M Linolite system of lighting and one room will be used for exhibiting these systems.

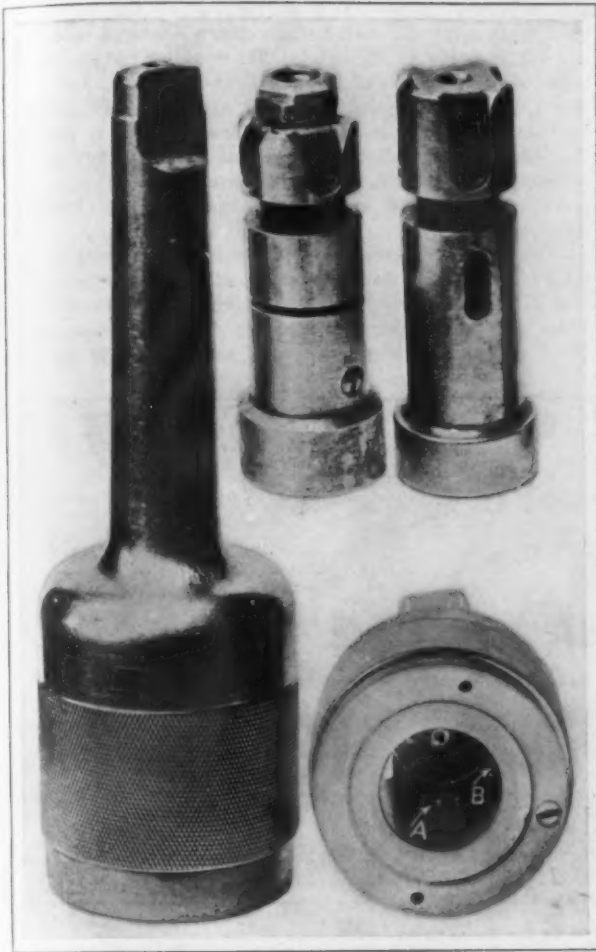
Company, which will hereafter also manufacture that line, continuing it under the established trade name of the Mechanics drill. The Mechanics Machine Company will devote its undivided attention hereafter to the manufacture of its automobile transmission. The Rockford Machine Tool Company is widely known in the trade in connection with the manufacture of planing, shaping and milling machines. Its business will be considerably expanded by the addition of an established drilling machine line. The company erected a fine modern fireproof plant in 1911, to which extensions will be made as the business warrants.

A New Type of Drill Chuck with Key Drive

The E. Horton & Sons Company, Windsor Locks, Conn., has developed an interesting type of drill chuck which can be furnished for handling all makes of drills and taps up to a maximum drill size of 2 in. and 1 1/4 in. U. S. standard taps. The drive is of the floating type on removable tool steel centers, two keys, A, 3/8 in. in diameter



View of the New Horton Drill Chuck in Use Showing the Variety of Tools that Can Be Handled



The Chuck and the Different Collets Supplied

being used, while the locking is accomplished by two $\frac{3}{8}$ -in. lugs, one of which is shown at B. The chuck can be supplied with either a No. 4 or No. 5 Morse taper shank and collets can be furnished which are bored to conform to No. 1, 2, 3 or 4 Morse taper, or for positive or friction drive taps.

The Improved Imperial Chain Hoist

The Franklin Moore Company, Winsted, Conn., has brought out an improved type of its Imperial chain block, which contains a number of new features tending toward

a large part of the loss by friction is eliminated by the use of hardened steel rollers for the bearings of the load shaft, and the rigid supports of the steel frame plates connecting the shaft and the top hook. Three steel disks or frame plates, in combination with the pressed steel casing, afford compactness and lightness. The two rear plates give very short center distances between the gearing, assisting to preserve perfect alignment, and the front and center plates give a short bearing for the load sprocket. Three long studs pass through the three plates, and with the separator bushings, lock the structure into a rigid unit, thus preventing the chance of twisting. The plates are very easy of removal, making the parts wholly accessible with little labor. The load chain guards run as rolls, insuring the free mesh of the load chain and sprocket.

A new and very important feature of this hoist is an automatic attachment for the control of the holding brake. It is in the form of an interior ratchet pinion mounted on a heavy stud near the outward end of which there is a slot to admit the floating pawl. The shape and location of the ratchet teeth are such that the pawl is automatically forced into place regardless of the speed at which the hoist is operated or its angle, and securely holds the load the instant the operator ceases pulling on the hand chain. It is a positive locking attachment, absolutely free from springs or frail parts. In lowering a slight reverse pull on the hand chain permits the load to descend smoothly, and under absolute control.

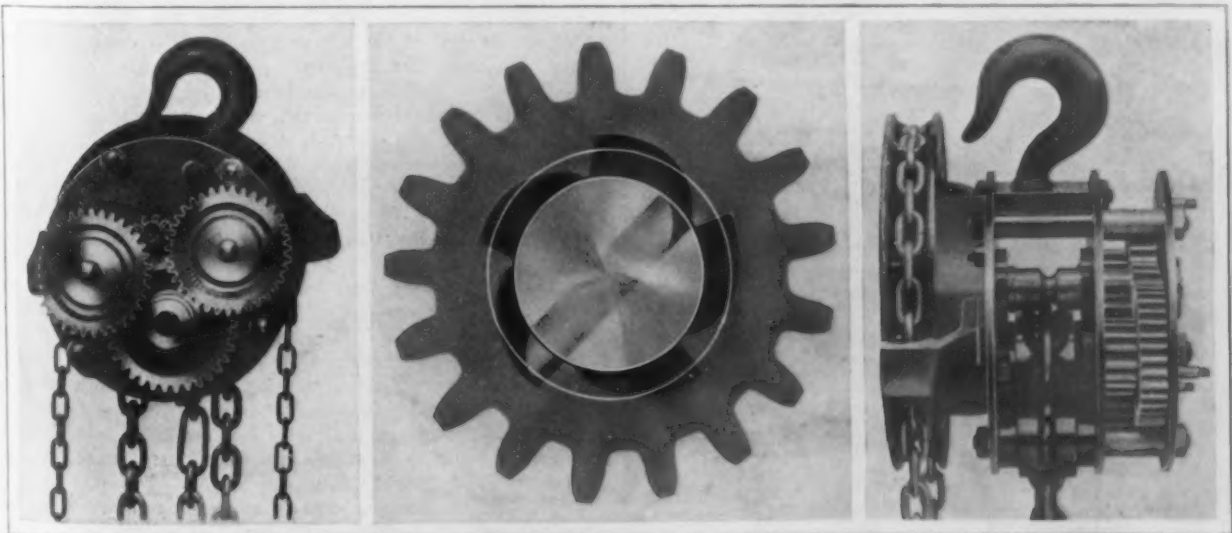
The chain block is made in the standard sizes, for capacities of from $\frac{1}{2}$ to 20 tons.

Marking Packages for Transportation

The Boston Merchants' Association, in its Bulletin, has issued the following appeal at the request of transportation companies, in the effort to reduce the evils of illegible or improperly executed bills of lading, shipping orders, etc.

"The bill of lading or shipping ticket should be type-written when practicable, and when not should be written legibly in ink or indelible pencil. All abbreviations, wherever practicable, should be avoided. Name of consignee and destination should be shown in full. The number of packages and weight, routing where specific routing is desired, and prepayment where shipment is to be prepaid, should also be noted. Care should be taken to have articles described as provided for in the classification (avoiding trade names) as to the definite name of the article offered for transportation, and the character of the packages should be indicated.

"Packages should be marked to show plainly the consignee's name and destination in conformity with the bill of lading. As additional precaution for the recovery of goods, should they go astray or arrive at destination and



End View

Brake Control Pinion

Side View

THREE VIEWS OF A RECENTLY DEVELOPED CHAIN HOIST WITH A SOMEWHAT NOVEL BRAKE PINION

strength, compactness, ease of operation and accessibility for repairs. The general mechanical principles involved are unchanged from the former model. Smooth running results from the balanced train of spur gearing, while the rapid raising and lowering speed is due to the fact that

be uncalled for, the shipper's name and the point of shipment preceded by the word 'from' should be marked on each package. The proper marking of packages also aids in obtaining correct loading, prompt forwarding, and proper delivery."

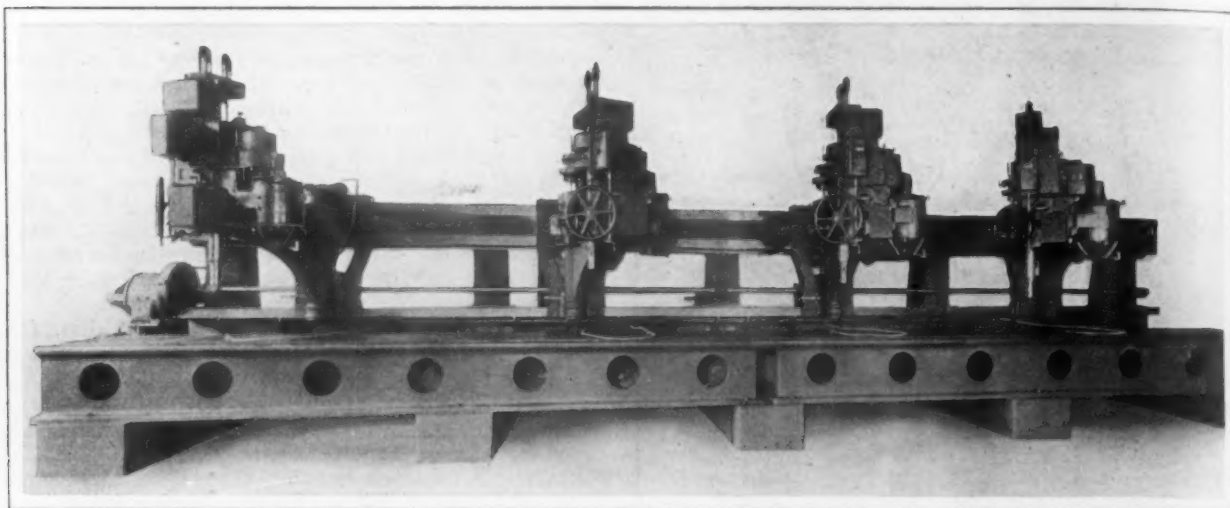
A Four-Spindle Radial Drilling Machine

A High Power Tool for Use in
Locomotive Boiler Construction Shops

For use in locomotive shops, Edwin Harrington, Son & Co., Inc., Philadelphia, Pa., has developed a four-spindle radial drilling machine. It is designed primarily for the boring of holes in boiler plates and will drill 1½-in. holes in steel plates at a speed of 65 ft. per min. As will be noticed from the larger cut, the machine has four radial arms mounted on one long cross rail. The arms have a power lateral traverse, in addition to the radial and a 30-in. in-and-out movement of the arm and the spindle head. Each head carries its own driving motor, and all

the traverse wheel. The gearing from the motor has two changes by a positive tooth clutch operated by a lever on the left side of the head. The spindles have a vertical traverse of 15 in. and have a large diameter, 2½ in., in the sleeve and a squared upper end measuring 1¾ in. for the driving gear. A No. 5 Morse taper is provided for the spindle, which operates at speeds ranging from 75 to 300 r.p.m. Ball bearings are provided under the counterweight yoke and to take care of the thrust in drilling.

The feed has three changes ranging from 0.005 to 0.015 in. per revolution of the spindle, the changes being controlled by a selective pin. The feed is driven by gears from the spindle through a safety friction and a positive tooth clutch controlling the feed worm and can be oper-



A Four-Spindle Radial Drilling Machine for Use in the Building of Locomotive Boilers

movements of the head are controlled by the operator from his position in front of the spindle.

The spindle heads have adjustable, steel rollers running on the wide top track of the arm, which, it is pointed out, provides easy movement by a handwheel and worm in an angle rack. The adjustable-speed motor for driving the drill, which is mounted on the back of the head behind the arm, develops 7½ hp., and has a range of from 825 to 1650 r.p.m., the controller handle being run down behind

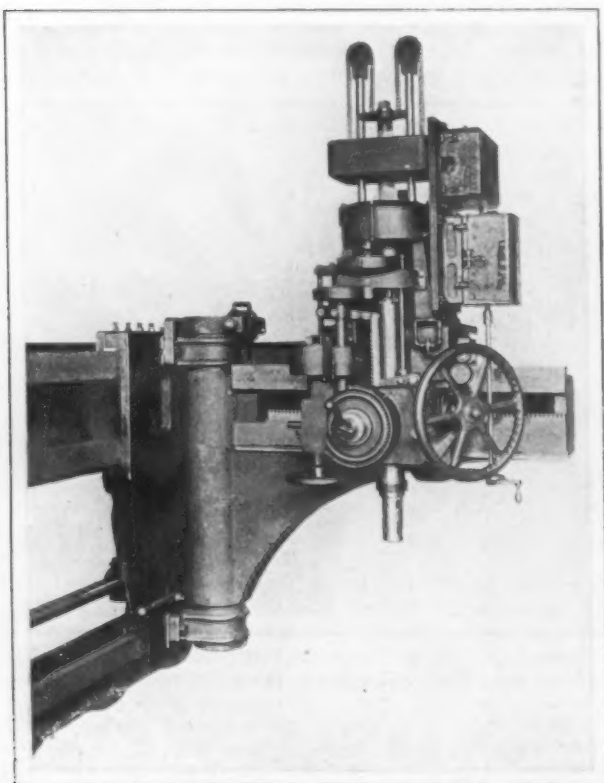
ated by hand or automatic trip. A wheel is provided on the worm for hand feed, and the rack pinion is connected to the worm gear by a quickly operated saw tooth clutch and hand lever for the spindle return.

The arms are of heavy box section and are mounted on the saddles by roller and ball thrust trunnion bearings. The binder on the top trunnion is operated by compressed air, which is led through a hose to a valve on the spindle head. A long bearing on the top rail is relied upon to keep the saddles from tipping, and there is a support against the lower rail to take care of the drilling thrust. The power traverse gearing is carried on each saddle, thus permitting independent motion in either direction by a double clutch between bevel gears. The 7½-hp. motor for driving the traverse operating shaft is located at the left end of the base, and, if necessary, can move all the heads simultaneously.

The cross rail is made double, the top part carrying the direct load and side strain, while the bottom takes the drilling thrust. These rails are fastened on five upright heavy box section uprights, which are mounted on a deep and heavily ribbed cast-iron base running parallel with the cross rail. Five cast-iron sub-bases support both the cross rail and the table and are intended to be placed underneath the floor.

The table, which has a working surface of 30 in. x 40 ft., is made in two parts, joined in the center, to make a continuous surface. The table is 24 in. high, and the minimum distance between it and the spindle is 13 in. There are three T-slots running the full length of the table. The cutting lubricant is distributed by a motor-driven pump through a flexible hose at each spindle, and a large gutter is provided to drain to a tank in the foundation.

The floor space required is approximately 10 x 43 ft. and the over-all height is 125½ in. The weight of the machine, including the motor, is 85,500 lbs.



An Enlarged View of One of the Heads

The Ohio Blower Company, Cleveland, Ohio, reports a good demand for steam specialties and ventilators. The company's November business fell little short of October, when it booked more business than in any previous month in its history.

Elements of Safety in Safety Goggles

Some of the Details Which
the Purchaser Should Consider

BY J. T. BRAYTON

The campaign for safety has developed no device for the protection of workmen more important than goggles. The reduction of eye accidents attributable solely to the use of goggles has been surprisingly large and immediate. That their use has been so effective is due not so much to the wearing of some kind of eyeglass by the worker, a precaution which in itself might increase rather than decrease the danger, as to the serious study opticians have given toward making lenses with a high power of resistance to fracture and toward the design of a properly protecting frame. In one type of goggle known as the "Saniglas" this power of fracture resistance has been raised to an unusually high point; and to the increase in resistance secured in these lenses, corresponding decreases in the losses due to eye accidents have been directly traceable.

It is a well-known fact that when the ordinary fragile optical plate or window glass is used of a thickness within reasonable weight, it offers but little, if any protection against the blow of a flying missile, with the result that the lens is shattered and the glass driven into the eye, thus adding to the complications and dangers. This condition or situation was taken into consideration with the first Saniglas constructed, and the lenses were made of the toughest and least breakable glass at that time available. With this model and lens the average losses were reduced from 6.5 per cent. to 2.8 per cent. Subsequent improvements in the construction of the frames and screens reduced this percentage of loss, and added to the comfort of the wearer. At length, the adoption of the special glass, now used as surfaced plano lenses, and changes in the construction of the frame, adding to its strength, comfort and safety, reduced the losses from eye accidents to 1.6 per cent., an achievement without parallel in safety devices.

In judging the results brought about by this industrial safety device, it must be remembered that it was introduced and made popular among a body of workmen who proverbially "take no thought for the morrow" and are only led to adopt and use protective means by examples of its value brought home to them in a drastic manner or by the persistent work of the safety inspectors and the officers of their company in educational campaigns.

The effects of accidents which the men have witnessed or are familiar with and the results of the educational work has spread among them a desire for cooperation in the "Safety First" movement until the majority of workmen now ask protection; a request with which their employers are hastening to comply. With both the employers and employed eager to obtain protection, the question arises, are they receiving it?

It is an axiom in trade that when something has been created which supplies a want, the just-as-good manufacturer or vendor finds his opportunity and rushes into the market with his imitation. If it bears a resemblance to the genuine article or can be sold at a cheaper price, he reaps his harvest. Quality and merit give place to resemblance and cost.

The average purchasing agent for a concern must make a good showing as to his ability as a buyer. He knows his firm wishes to purchase safety goggles, but has no personal experience with what constitutes real safety in that line. One piece of glass looks to him much like another, and why should not one lens of the same thickness shatter as easily as another. These questions are Greek to him. When therefore, he compares goggles offered him at high and low prices why should he not buy the cheaper? The lenses are just as thick or perhaps the substitute is one millimeter thicker with some attachment in addition, to which his attention is called as a point of undoubted merit. Appearance and price usually decides and the record for safety of the better lens is often swallowed up in the cheaper price.

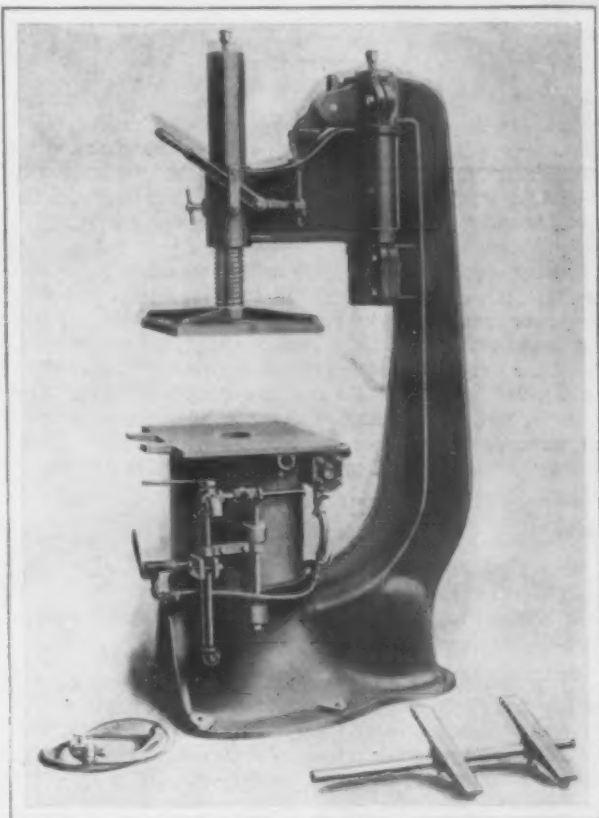
Is safety purchased in this manner, real safety? Is the saving of 10 or 15 or 25 cents per pair on safety goggles an economy? Can the employers of workmen engaged in occupations which demand that every safeguard possible be employed allow the use of safety devices which are cheap instead of those of approved merit? This is a question

which is up to the safety and not to the purchasing department and should receive careful consideration.

The frame of the goggles should be constructed entirely of non-tarnishable white metal, and should be free from leather or chenille so as to be absolutely sanitary and capable of being sterilized without trouble. Such a frame is found comfortable to wear and, made in six different dimensions, allows for satisfactorily fitting faces.

A Universal Squeezer Molding Machine

A new universal molding machine has been brought out by the Berkshire Mfg. Company, Cleveland, Ohio. This machine, which is a power squeezer, is very simple and rigid in construction, its main parts consisting of only



A New Universal Molding Machine of the Power Squeezer Type Having Only Six Main Parts and a Stationary Piston

six castings. A feature is that instead of having a movable piston and stationary cylinder as in other types of machines, the piston is stationary, being bolted to the base of the column and the ramming of the mold is effected by raising the cylinder underneath the table until the mold comes in contact with the pressure head. The table is bolted and dovetailed to the cylinder.

The machine is equipped with an adjustment lock so that the mold can be squeezed uniformly without regard to the air pressure and the same amount of pressure applied to any number of molds. The squeezer head can be adjusted to the desired height by a 3-in. screw in the head, which is adjustable from 3 to 16 in., adjustment being quickly made by loosening a clamp screw. The cylinder is 12 in. in diameter and the piston has a 5-in. stroke, but in practice it is stated that the squeezer head may be set so that a mold can be squeezed by raising the table only 1 in. The head swings either way on a 3-in. shaft in ball bearings, an easy movement being provided by 30 $\frac{3}{16}$ -in. balls running in hardened races. Lubrication is provided internally from an oil cup located on the top of the head. The head is locked in position by a hand lever in front, which when operated raises a steel latch and releases the head. The air supply is controlled by a single three-way valve that is operated by a lever in front of the machine. All of the operating parts are well protected from sand.

The machine can be used either with split pattern plates, with match plates or with plain gates. It will take a flask 16 in. high, 22 in. wide and of any length.

Power Required for Rolling Metal*

A Rational Formula Showing Value of Small Rolls, Heavy Reductions and High Temperature, and Therefore High Rolling Speed

BY VICTOR E. EDWARDS†

When we consider the vast amount of work, of money and of ability expended by Dr. Puppe in developing a formula for the power required to roll metal, it is indeed unfortunate that he did not choose a formula that was rational. His formula

$$\frac{(Q_1 - Q_2) L_{q_1}}{\text{work done}} = C$$

is bad for covering the ordinary range of single reductions. For figuring a group of passes as necessary when considering continuous mills, it is useless. Its absurdity is obvious when one notes that by this formula twice the work required to give a 50 per cent. reduction will give 100 per cent reduction.

Twenty-eight years ago the writer was asked to compute the power required to roll billets to rods and also the power required to draw the same rods to wire. It was first necessary to assume a common unit for comparison. One base only appeared rational—the power required to cause a unit reduction of a unit mass in a unit time. The units the writer first adopted were: a unit reduction of 50 per cent., or doubling of the length; a unit mass of one ton, and a time unit of one minute. This gave a formula

$$HP = C T D$$

where

C = Constant.

T = Tons worked per minute.

D = Doublings or number of times the length has been doubled.

This formula led the author to prepare a table of lengths and doublings, corresponding with each successive per cent. reduction from 1 per cent. to 99 per cent. The last column of this table was, of course, a table of logarithms having 2 for a base. For example:

50 per cent. reduction = length 2	Log 2 = 1 (doubling)
75 per cent. reduction = length 4	Log 4 = 2 (doubling)
87½ per cent. reduction = length 8	Log 8 = 3 (doubling)
25 per cent. reduction = length 1.33	Log 1.33 = 0.415 (doubling)
etc.	

But this was entirely unnecessary labor as every one knows that logarithms of any base are made by multiplying common logarithms by the reciprocal of the common logarithm of the desired base, or in other words, by a constant. Hence the formula is more available when common logarithms are used, and it becomes

$$HP = C T \log E$$

where

$$E = \text{Elongation} = \frac{\text{length after rolling } Q_2}{\text{length before rolling } Q_1}$$

This simply changes our unit reduction from 50 per cent. to 90 per cent.; 90 per cent. reduction having an elongation of 10 to 1, and 10 is the base of our common logarithms which are universally available.

In the above formula C is a constant when other conditions are constant, but other conditions are seldom constant. Everyone knows that the blacksmith can elongate a bar most easily on the small end of the horn of his anvil. But what is the formula? Careful and extended dynamometer tests of cold rolling relatively wide strips of commercially pure aluminum, showed clearly that the power required increased somewhat faster than $\sqrt{D \div t}$ where

D = Roll diameter.

t = Finished thickness.

This changes our formula to:

$$HP = C T \log E \sqrt{\frac{D}{t}}$$

Commercially pure aluminum was chosen because its malleability is perhaps exceeded only by gold and silver, and it does not harden appreciably with continued rolling. Averages of repeated tests plotted on logarithmic cross section paper to the above formula as shown on the ac-

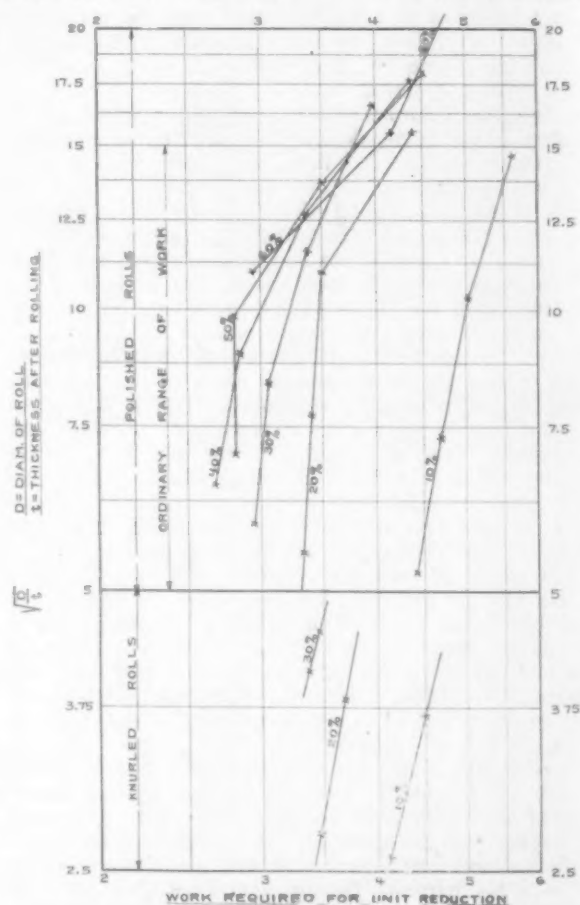


Diagram Showing Relative Work Required to Roll Plates of Varying Final Thickness and Percentage Reductions

companying diagram, appear to indicate that the power does increase almost directly as $\sqrt{D \div t}$ between the values $\sqrt{D \div t} = 5$ to $\sqrt{D \div t} = 10$. After passing the latter point the power required increases more rapidly, until for values $\sqrt{D \div t} = 15$, the unit power required was 30 to 50 per cent. more than called for by the formula. Perhaps part of this was due to the hardening of the aluminum by the continued rolling. But is not much of it due to the increased ratio between the arc of contact and the thickness of the metal? In other words, is it not true that more pressure per unit area is required to compress a very thin sheet of metal between two flat plates than would be required to compress a much thicker sheet? The diagram also appears to indicate,

1. That 40 to 60 per cent. reductions are most economical in use of power.

2. That reductions less than 30 per cent. are extravagant in power consumption, due, perhaps, to excessive proportion of journal friction.

*Paper presented to Engineers' Society of Western Pennsylvania, October 21, 1913. It may be remarked that it is based on an experience obtained in the calculations for design and the operation of 70 continuous rolling mills.

†Vice-president Morgan Construction Company, Worcester, Mass.

3 That rough rolls require much more power than smooth rolls.

Let us assume a concrete example of a pure continuous mill rolling wide flats, taking 50 per cent. reduction at each pass. If we assume the roll diameters and temperature to be constant then each pass would, from the above formula, require $\sqrt{2} = 1.41$ times the power required by the preceding pass.

Another factor nearly as important as roll diameter is temperature. Someone has covered this in what appears to be a perfectly logical way by assuming that power varies directly with the tensile strength of the bar being rolled. Adding this makes the formula quite complete:

$$HP = C T \log E \sqrt{\frac{D}{t}} S$$

where

S = Tensile strength at the rolling temperature.

This formula clearly shows why a continuous sheet bar mill may require more power to deliver bar $\frac{1}{4}$ in. thick than it does to deliver twice the tonnage at the same speed of bar $\frac{1}{2}$ in. thick and only slightly warmer. It is interesting and easy to remember that through nearly the entire range of rolling temperatures, a reduction of 400 deg. F., practically doubles the tensile strength and hence the power required to roll.*

The formula also shows why the Morgan Construction Company has always used small rolls and high speeds to conserve temperature and power.

At least one more factor is necessary to make the formula complete—the efficiency of the pass. Obviously the metal can take the speed of the roll at one point only in the arc of contact. At all other points the metal must slip, either against the face of the roll or internally. (As an example: It is well known that barrel hoop may deliver fully 10 per cent. faster than the surface speed of the roll.) This slipping, either external or internal, requires and wastes power. The smoother the roll the less power wasted. You all know cold rolling is done in oil. You also recall that all rolls for cold work are ground as true and smooth as possible. Should not the same reason lead us to grind with much care all rolls for hot work that can be so finished. Less power is required. The rolls last longer. Better work is produced.

The foregoing all applies to plain flat passes. The efficiency of all shaped passes decreases as the slipping increases. This loss of efficiency is especially noticed in some of the passes used in rolling rails. But the benefits from using such passes may fully warrant the resulting excess roll wear and power. We have already seen from our diagram that light reductions have a low efficiency. It may not be easy to get a formula that will cover the efficiency of a pass, but it should not be overlooked in computing power requirements.

Dr. Puppe has published a vast amount of reliable data. Motor-driven mills offer reliable data with almost no effort. The Gary billet mill data is excellent for several reasons:

There are no inertia corrections to be made.

There are no complications by overlapping of passes as in regular three-high mills.

The bloom is turned after each pass so that the section is never far from square, i.e., the efficiency of all passes is nearly constant.

The reductions are exceptionally uniform and heavy.

The reductions are extended—from a heavy ingot to $1\frac{1}{4}$ -in. square billet at one heat.

The temperature is fairly constant for all passes.

The figures of the Gary motor-driven mills, published by Mr. Shover, plot out beautifully by our first simple formula:

$$HP = C T \log E$$

Such a plot shows clearly that the unit power steadily increases from the first ingot pass to $1\frac{1}{4}$ in. square by some 6 per cent. to 9 per cent. for each pass. This increase in power, or in C , is explained first by increase of $\sqrt{D} \div t$ and second by cooling. A comparison of these figures with those from the adjacent rail mill, clearly emphasizes "pass efficiency" and the difficulties of estimating the power required for complicated passes.

*Kent, p. 440. Kollman's experiments at Oberhausen.

Suit to Dissolve the American Can Company

Suit was filed November 29 in the United States District Court at Baltimore to dissolve the American Can Company. In addition to that company, the complaint names the American Sheet & Tin Plate Company, Sanitary Can Company, Missouri Can Company, Martin Wagner Company, Boston Wharf Company, Max Ams Machine Company, Freeman Duncan Transfer & Realty Company, and Hawaiian Pineapple Company, Ltd., as defendants. In its complaint the Government alleges practices in restraint of trade and seeks a dissolution other than on a pro rata basis, by asking for a separation into units of different ownership to insure the restoration of competition.

The Government hopes to prove that for some time after organization the American Company controlled about 85 per cent. of the trade. While that quantity is admitted to have diminished, it is said now to be close to 50 per cent. In agreements made with the American Company by the concerns it absorbed, they were not to engage in can manufacture within a radius of 3000 miles of Chicago for 15 years, according to the Government's petition. The Government alleges that its domination of the market is so absolute that such independents as have come into being have been forced to follow its prices and it has compelled customers to make long-term contracts to purchase cans exclusively from it.

The defendants must appear and answer within 20 days after the service of the subpoenas and bill of complaint.

President F. S. Wheeler of the American Can Company makes the following statement:

While the company regrets that the Government has thought proper to bring this suit, it has no fear or misgiving as to the result. Neither in the origin of the company nor in the subsequent conduct of its business has monopoly or restraint of trade been attempted or attained. None of the methods commonly known as "unfair competition" has been employed by the company. It has been party to no agreements or understandings, express or tacit, seeking to control or regulate prices, nor has it sought in any way to rule or dominate the industry in which it is engaged. It has no such share of that industry—only about one-third—as would enable it to rule or dominate it, even if it had the purpose to do so. Competition is wholly free and keenly active in that industry. The company has striven, and will continue to strive, to get all of the business it can, profitably to its stockholders, but it has done and will do this not by futile attempt to monopolize or dominate the trade, but by seeking through the very best methods of efficient organization, of manufacture, and of distribution, to meet better than others all the rightful needs of those who use its products.

The company was capitalized at \$88,000,000, of which \$82,466,600 is outstanding, equally divided between preferred and common stock. The preferred, which is 7 per cent. cumulative, did not for several years pay full dividends, but on January 1, of this year, the company paid off 24 per cent. in back dividends thus accumulated, leaving about 9 per cent. still to be made up. It has a funded debt of \$14,000,000. Over 40 factories are now owned by the company, located in the United States and Canada, with one in the Hawaiian Islands.

Second Shipment of East Texas Iron Ore.—The second cargo of 3000 tons of East Texas brown hematite ore, consigned to the Alan Wood Iron & Steel Company, was unloaded at Philadelphia last week. The analysis, as given by B. Nicoll & Co., sales agents, New York, is as follows: Metallic iron, 56.03 per cent.; manganese, 0.126 per cent.; sulphur, 0.092 per cent.; phosphorus, 0.09 per cent.; alumina, 2.728 per cent.; silica, 6.135 per cent. The two cargoes were hand mined ore, shipped as trial lots. Steam shovel mining will probably begin in February, 1914, when further shipments will be made over the Port Bolivar, Texas, dock.

Manufacturers of tin plate and window glass in the Pittsburgh district are stated to be preparing to demand a reduction in freight rates to the Pacific coast because of foreign competition resulting from the reduced tariff. Tin-plate manufacturers desire the railroad companies to reduce the present rate of 70c. per 100 lb. to 50c. The window-glass manufacturers ask to have the window-glass rate reduced from 90c. per 100 lb. to 65c.

ESTABLISHED 1855

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Good Progress in Liquidation

Liquidation in the steel situation has been making remarkably rapid progress. Through a combination of circumstances the liquidation started early, while the amount requisite for the making of a fresh start was relatively limited.

In the matter of stocks, the liquidation which began in the latter part of 1907 was necessarily an extensive one because the stocks were large. There had been a period of three years in which steel mills continuously operated at full capacity and buyers had to take material when they could get it. In 1906 the mills in many departments were six months behind in the filling of actual specifications. Buyers became accustomed to carrying large stocks, for without complete assortments they could not do the full amount of business offered them.

The next period of liquidation followed the rapid rise in prices and the heavy buying movement of the latter part of 1909. In this case the stocks had a different cause for their existence. As prices rose from May to December, 1909, the mills freely accepted large contracts, and then when advanced prices were maintained with considerable steadiness in 1910 the buyers took in material against their cheaper contracts as the apparent profit was too large to be surrendered. Again there were large stocks which had to be liquidated.

In the recent movement, on the other hand, there has been no influence toward the accumulation of stocks beyond such as were absolutely necessary for the conduct of business through a period in which the mills were not seriously behind in their deliveries. In the mind of the buyer there has been more or less doubt as to the stability of prices since very early in the year.

In each of the former instances a full twelvemonth was required to liquidate stocks. In the present instance a much shorter period is assured, and a considerable part of the liquidation, in all probability far the major part, has already occurred.

In the matter of prices there is likewise much less to liquidate than was the case in the two previous movements. The top of the recent movement found steel prices about \$2 a ton lower than they were at the top of the 1909 rise, and more than \$5 a ton lower than they were at the close of 1907. The cost of production, on the other hand, is claimed to be higher, chiefly on account of advanced wages, than in either of the two former periods. The price level reached at the close of the 1911 liquidation was the lowest since the hard times period of the nineties, being the lowest with that exception in all history; and the declines which have already become an open market fact have brought prices on a good many products to a point not far above the 1911 level.

With so much already accomplished along concrete lines, the future of the steel market may prove to hinge a great deal more upon the mental attitude of steel sellers than these sellers themselves imagine. Their attitude at the moment is that of endeavoring to forecast the future of business in general with a view thereby of forecasting their own future. Two suggestions may be made: First, that the recovery of 1912, after the extended period of liquidation, would have been more rapid had the mills not been so willing to sell far ahead at practically the minimum prices then developed. While the general declining tendency in prices ceased in November, 1911, it was not until the

following April that a clear-cut general advance began. Second, it may be suggested that on account of the reduced tariff buyers will be disposed to regard contract obligations still more lightly than in the past, and the value of contracts to the seller, always problematical, will be further reduced. If the sellers desire to hasten a recovery they will do well to refrain from booking contracts for far forward delivery.

The Buyer's Turn for a Dressing

In his rôle of schoolmaster of the American people, President Wilson should essay a new task. He has chastised the manufacturers by forcing a bill through Congress heavily scaling the duties on foreign merchandise coming in competition with their products. He has further threatened to scourge all large corporations by greater activity in the trust-busting department of the Government and with promise of more drastic legislation. The real job now confronting him is to lash the people into a frame of mind to accept the new freedom he has given them and to show that they are so rejoicing in that freedom that they are purchasing as freely as they did a few months ago. So far they are not accepting the new order of things in the proper spirit. They are not buying as they should, or mills and factories would not be curtailing operations and discharging workmen. What the mills need is more orders, and the people are not placing them. The President should see to this delinquency.

The Cycle and the Iron Trade

For many years it was possible to trace a cycle in the American iron trade, whereby events were repeated after a 20-year interval. The parallelism was so close that it attracted quite general attention. It is interesting to observe that the parallelism disappeared last year. So close was the previous conformity, and so wide has been the recent divergence, that it has become practically impossible for the conformity to be restored.

The great basing points were the years 1873 and 1893, both years of financial panic and years productive of great distress in the iron trade. Following each of them was a period of about five years of industrial depression, the later period, however, being marked by the "soda water rise" of 1895, which did not have its counterpart in 1875. In both 1879 and 1899 there was a great boom, with the excesses naturally indulged after a long period of depression. Each boom was followed by a sharp but short recession or readjustment, and, to make a long story short, the ups and downs coincided with remarkable closeness up to the years 1891 and 1911 respectively, both of which were relatively dull or off years. Then the divergence began, at first narrow and afterward wide. Late in 1891 came a slight improvement in business, just as was the case in 1911, but in 1892 the improvement was lost, conditions growing almost steadily worse into the panic year 1893. The slight improvement late in 1911, on the other hand, developed in 1912 into a period of genuine prosperity. Here was the divergence, in that business in 1912 ran away from the conditions of 1892, so that on the whole the movement now ended found no counterpart at all 20 years earlier.

It is true that 1893 and 1913 are similar to an extent, both being years of falling prices, but 1893 rep-

resented a fall without there having been a preceding advance, whereas up to the present time in 1913 prices have not receded to the level of late 1911.

It is upon the failure of the market movement of the past two years to coincide with that of 20 years earlier that the breaking down of the cycle is to be predicated, rather than upon the failure of 1913 to bring a panic. From the standpoint of iron market history a panic may be an incident, rather than a governing event, for the course of the market after the panic of October, 1907, followed with considerable closeness the course of the market 20 years earlier, though in 1887 there was no semblance of a panic, but merely a slowing down in industry.

Apprenticeships Without Indenture Papers

Some manufacturers are dropping the indenture system in the employment of apprentices. The old custom was to bind the boy to a master until he should become of age. The relation was much the same as that of parent and son. In the evolution of industrial conditions the term of service in the mechanics' trades came to be restricted to three or four years, and even to two years in certain employments. But the written contract continued to be made between the owner and the boy, a sponsor agreeing to forfeit a certain sum of money if the apprentice should break his agreement, while the employers reserved the right to discharge him because of inaptitude or other good cause. Such a bargain is fair enough, because the owner pays the boy for the earlier months of his time, when his services are worth little or nothing, and plans to come out even in the latter periods of the term, as the apprentice achieves some degree of skill.

Various objections to the practical workings of this system have arisen. One of the most important is the difficulty of getting the right kind of boys to undertake the course. The obstacle of the money forfeit of the indenture papers is a serious one nowadays, when the sort of lad who used to seek with eagerness the very honorable vocation of mechanic has other ambitions. It is held that a verbal agreement between the owner and the apprentice is just as binding for all practical purposes. If the indentured boy tires of the work, but stays on to save the forfeit for his bondsman, his value to the shop is seriously restricted. Usually in such cases the employer waives the forfeit and releases the apprentice from the contract, or else is compelled to discharge him later for lack of efficiency.

Another advantage of the verbal contract is the greater flexibility given the apprentice course. In one shop of medium size this has proved wholly advantageous. It is agreed that the boy shall receive a certain wage the first year, with an increase each succeeding year for four years. He can reckon on these earnings, if he is kept at all. But if he shows unusual ability in his trade he may be advanced before the end of a stated period—at the end of 10 months, perhaps, instead of a year—and he may be graduated before the close of the four years, to receive the still greater emolument of a skilled journeyman.

It has been argued that under such a system as this the temptation will be greater to slight the boy's training, to regard him rather as an ordinary young employee in the shop than as an apprentice, and to fail to give him the full all-around mechanical education to which the contract should entitle him. Probably

little difference exists in this respect between the written and the unwritten contract. It is a well-known fact that in some works the interest taken in apprentices is too strictly confined to making the maximum of money from their services. But indenture papers have little to do with preventing such a condition. It is rather a question of the sense of responsibility of the owners and their representatives in the shop.

Correspondence

Pensions, Bonuses and Profit Sharing

To the Editor: Pension systems, bonuses and profit sharing schemes all seem to be viewed very much the same by most of us, but when subjected to analysis they are quite different.

Profit sharing is dependent upon the prosperity of the business. If it comes to the workman as a dividend upon stock which he has been allowed to purchase, he as a stockholder sometimes receives a statement showing that the dividend has been passed owing to the absence of net earnings for that particular year. If he receives the dividend, however, as a voluntary distribution at the end of the year by the firm, it loses its relation to profits; he depends upon it, probably having altered his standard of living accordingly. This voluntary distribution of profits is the form of excess payment to which the workman is least entitled, as it depends in a large degree on the amount of business brought in, and this is beyond the control of the manufacturing department.

Bonuses are paid as a compensation for extra effort or time saved by one man, or a gang of men, and bear a direct relation to the output. They are offered to the men as an incentive to exert themselves and thereby earn a reward for maintaining something more than an average pace. This is the form of added compensation to which the workman is most entitled.

It has been argued that anything offered to the workman as an inducement to remain in a firm's employ, or to work harder, should be classified as wages. However, pensions, although undoubtedly offered as an inducement to long service, come under head of what is known as welfare work. They are not affected either by the earnings of the business or the ability of the workmen. Like the distributing of profits they constitute a gift pure and simple, being an appreciation of the employee's services and fidelity. Such being the case, pensions are not a form of wages and may very properly be considered deferred payments. The fact that the workman receives a pension only by accident of being an employee at the end of a stated term of years would indicate that it is not considered a part of his regular earnings. If it were apportioned according to his ability it might be considered as wages.

H. D. MURPHY.

JERSEY CITY, N. J., November 25, 1913.

Harbison-Walker Annual Report

The Harbison-Walker Refractories Company, Pittsburgh, Pa., has issued its eleventh annual statement covering the year ended September 30, 1913, which makes a most excellent showing. The earnings, after deducting \$464,017.14 for ordinary repairs and maintenance and depreciation of plants, were \$1,723,463.68. The outlay for extraordinary repairs and improvements, depreciation of mining outfits and depletion of mineral properties was \$197,499.34, leaving a net profit for the year of \$1,525,964.34. The net surplus for the year, after the payment of interest on bonds and dividends on stocks, was \$550,589.34. The total surplus September 30, 1913, was \$6,090,777.12.

President H. W. Croft, in his accompanying statement, says: "Costs were high, although a larger amount of business was transacted than during the previous year. An advance of from 8 to 10 per cent. in wages was made on April 1. Costs were also increased by the scarcity of labor and by the necessity of training inexperienced men. We are pleased to report that the company is now free of bonded indebtedness. The \$3,500,000 issue of bonds, due in

1922, for the payment of which a sinking fund of \$175,000 per year was required, was completely retired the past year, thereby anticipating the final payment by nine years."

Book Review

The Future of the Working Classes. Economic Facts for Employers and Wage Earners. By Roger W. Babson, president Babson Statistical Organization, Wellesley Hills Station, Boston, Mass. Cloth. Pages 76; size 3 x 8 in. Publisher, the Babson Statistical Organization, 6 Congress street, Boston, Mass. Price, 50 cents.

This booklet is based on certain lectures delivered by the author in London and Paris in March and April, 1913. The contents are divided in three sections. The first discusses the question, "Can the Working Classes Ever Become Prosperous?" The second treats of the subject, "Upon What England's Power Depends." The last is entitled "The New Step and the Evidence." The first section shows the close inter-relations between capital and wage earners, in which the general principle is laid down that if the workers win a strike for wage increases, shorter hours, accident compensation, etc., they have but temporarily increased their proportion of the profits of a business, as the money soon flows back to the employers through higher rents, advanced prices and greater interest rates. The proportion of money which the workers retain is not increased by any of these means, but continues to bear the same relation as before to the employers' proportion. The author therefore claims that workmen, in their endeavor to improve their condition through efforts to advance wages and shorten hours of labor, are proceeding in the wrong direction. He claims that modern free schools now increase the wants of the working classes and stimulate spending but do not aid in obtaining for them a greater proportion of the world's wealth. He therefore says that "so long as wage earners are anxious to have their children taught the fashionable sciences instead of such fundamentals of character and intelligence as develop producing capacity they will never be prosperous and strikes are inevitable, while on the other hand, when these children are trained to concentrate and think, to organize and reason, to work and rule, to combine for borrowing and lending, they will then have a chance to really win."

In the second section Mr. Babson draws a comparison between England and France on one side and Germany on the other with regard to systems of education. He claims that the present power of the German nation is due to the training which the previous generation received, a training which developed both character and intellect, and which was directly due to the influence of Christianity. His closing section states that the present system of giving children approximately ten years of schooling, followed by a life of work, must be changed to a system of economic education in which in the first period, up to about nine years, the child should be taught to work for an hour each day at producing something under school control for wages, and greater attention should be given to developing concentration and moral courage so that character building should be a feature from the first. He would devote an entire half year to forming one habit, such as honesty or unselfishness or respect. The second period of education, starting from about nine and running to about fifteen, should be given partly to the development of moral courage, self-control and allied traits, being the period when young people begin to reason and when idleness is such a danger. In this time the school should be open the same hours as are business houses, so that the children would have two hours of unrestricted play and two hours of real work under trained instructors, in addition to about four hours of study, the work being of a character for which the parent can be paid. Graduation from this period should depend upon how this work is performed. In the third period, running from about fifteen years, the great work should be to develop a desire and hunger for such character and intelligence as will make them most prosperous.

Mr. Babson says that all classes must understand that a nation is most prosperous only when its production is greatest and the enjoyment of these producing powers is most evenly distributed. The book is highly idealistic, but the reasoning and suggestions are well calculated to attract attention and excite discussion.

The Steel Corporation Dissolution Suit

Many More Witnesses Testify Regarding
Active Competition in the Steel Trade

The report of the hearings in the suit for the dissolution of the United States Steel Corporation given in *The Iron Age* of last week ended with the proceedings on Monday, November 24. On Tuesday a number of additional witnesses for the defense were examined.

Albert E. Converse, president H. C. Tack Company, Cleveland, Ohio, manufacturer of tacks and small nails, testified that his company, which started 25 years ago, under the name of the Honest Count Tack Company, buys large quantities of sheets and wire. They are bought from a number of makers in the Middle West on a competitive basis. He said he is visited by salesmen from a great many steel companies and the prices quoted by them vary considerably. He said he would expect quotations to vary about \$2 a ton. Out of four or five, he said, there would likely be two or three that would quote about the same. There has been no price uniformity, whatever, he said.

Price Agreements, if Made, Have Been Violated

John H. Smith, president and general manager of the Smith Brothers Hardware Company, Columbus, Ohio, stated that his company handles nails, steel wire, barb wire, staples, poultry netting, wire cloth, steel fence and other commodities. They are purchased from large numbers of manufacturers and wholly on a basis of competitive selling. In reply to a question as to whether he found these manufacturers agreeing on prices, he said: "If there was any agreement to fix prices it certainly has been violated for the last ten years." He testified that the profit to the jobber on nails is often not more than 2½¢ a keg.

Samuel D. Latty, president Kirk-Latty Mfg. Company, Cleveland, said his company buys bars, rounds, squares, half ovals, hoops, bands, sheets and wire and for these it spends about \$250,000 annually. Bids are generally asked from about three or four manufacturers, as it is not the company's policy to scatter business too much. He said: "I have found that gives the competition, and I wanted to make my business with all the companies that I bought goods of desirable enough so that they would care for it in a way that would be satisfactory to us."

Plate and Billet Competition

Wm. H. Todd, president Robins Dry Dock & Repair Company, Brooklyn, N. Y., testified that his company buys plates, shapes, beams, bars, rivets and everything else that pertains to the construction of a ship. Before making purchases, of plates, for instance, the company always asks for quotations from several plate makers, mainly Lukens, Worth and Carnegie. Mr. Todd said that he never remembered plate quotations by these three companies to be uniform during the seven years that he has been familiar with the purchases of his company. Competition, he said, has been keen.

Bernard E. Pollak, treasurer and general manager of the Pollak Steel Company, Cincinnati, stated that his company buys steel billets to the amount of 50,000 to 60,000 tons a year. These billets have been bought from a great many different makers, mainly on contracts for future delivery. Before placing such contracts, he said, his company ordinarily solicits bids from six or seven manufacturers, getting varying prices.

On Wednesday Charles M. Wambaugh, president Columbus Chain Company, Columbus, Ohio, testified that his company, one of the largest chain makers in the country, buys about \$50,000 worth of wire rods, about \$5000 worth of steel bars and \$75,000 to \$100,000 worth of iron bars a year, generally on contracts, which are placed in June and December. Bids are asked from various manufacturers and the resulting quotations always are found to vary considerably. In cross-examination, Mr. Wambaugh said that in the wire-rod market the American Steel & Wire Company had been a factor which tended to keep the market from running away and also from going below a reasonable level in times of depression.

Attacks Inferences of Government Witnesses

C. S. Rindsfoos, secretary of the Foundation Company, New York, testified that his company is a large buyer of

reinforcing bars. He had with him copies of contracts which his company has made with reinforcing bar manufacturers from the spring of 1909 down to the present. He also had the original tabulations showing bids received from the various manufacturers when his company was getting ready to let a contract. These showed that prices, as quoted by manufacturers, varied all the way from 10c. below to 30c. per 100 lb. above the price which was published contemporaneously in the trade papers. By this testimony the Steel Corporation attorneys sought to show that, at times when the trade paper prices were unchanged over a considerable period of time, the manufacturers were actually charging varying prices, thus controverting the claims made by Government witnesses at the hearings in Washington, that periods of constant prices in trade papers reflected the contemporaneous existence of price agreements among the various manufacturers.

How a Great Hardware House Divides Its Purchases

William Heyburn, president Belknap Hardware & Mfg. Company, Louisville, Ky., testified that his company is one of the three or four largest hardware houses in the country. It handles a great many steel products. At the present time, 1913, it is buying 78 per cent. of its bars from the Carnegie Steel Company and 22 per cent. from the Cambria and Republic, which, he said, is fairly representative of the way the steel bar business of his company has been awarded the past five years. He has always found bar quotations to vary and during the past ten years, at least, competition has been sharp. His company solicits bids before awarding contracts for the other steel products which it handles. In buying tubes, he said, he used to deal with the La Belle Iron Works, but now buys all his tubes from the Republic Iron & Steel Company. He does not buy from the National Tube Company, as the latter never submitted "a favorable proposition." He has always bought nails from the Kelly Nail & Iron Company and the American Steel & Wire Company. At the present time 46⅔ per cent. of the company's sheet and roofing requirements are being bought from the American Sheet & Tin Plate Company, while 53⅓ per cent. is divided between the Portsmouth Steel Company, the Newport Rolling Mill Company and the McCullough Iron Company. In the past five years the American Sheet & Tin Plate Company has taken about 60 to 65 per cent. of his company's sheet and roofing business.

Railroad Purchasing Agents and Interlocking Directors

On Friday purchasing agents for the Erie, Lehigh Valley, Central of New Jersey and Philadelphia & Reading railroads testified that although such men as George F. Baker, H. C. Frick, Charles Steele and Norman B. Ream are common directors in the Steel Corporation and their respective companies, the corporation was never favored with orders for steel products in preference to other steel producers, and no influences were used to divert the trade of the roads to the corporation. Those who thus testified were: H. S. Montgomery, Elizabeth, N. J., purchasing agent for the Lehigh Valley Railroad; Willard R. Collins, Newark, N. J., purchasing agent for the Erie Railroad, and John D. Landis, Philadelphia, purchasing agent for the Philadelphia & Reading Railroad, Central Railroad of New Jersey and two large coal companies.

Wm. M. Crane, president of the Wm. M. Crane Company, manufacturer of gas appliances, Greenville, Jersey City, N. J., testified that his company buys sheet steel and pipe, principally on contract. In placing a contract it calls for quotations and then awards the contract to whichever concern will give the best terms. He said the quotations received always vary. The Crane Company, he said, never makes any purchases from the National Tube Company.

On Monday, December 1, five more witnesses testified that as extensive buyers or manufacturers of steel products of every description they found free and active competition. Quotations as a rule varied, they said, although there were periods during the last ten years when they were uniform, as between various manufacturers. Those who testified were: F. O. Schoedinger, president F. O. Schoedinger & Co., Columbus, Ohio; Joseph B. Andrews, president Andrews Steel Company, Newport, Ky.; James Stephenson, president Cincinnati Iron & Steel Company; A. G. Belmer, Cincinnati, and C. L. Greeno, president C. L. Greeno Company, Cincinnati.

Seventeen Furnaces Go Out Steel Companies' Output Much Less

Production December 1 at the Rate of 26,500,000
Tons a Year

Pig-iron production in November fell off rapidly, due to the curtailment of output at steel works furnaces. Practically complete returns were in the hands of *The Iron Age* on December 2, through the gratifying cooperation of the furnace companies, and thus a new record was made in the compilation of these statistics. Our tables show that the output of coke iron in the 30 days of November was 2,233,603 gross tons, or 74,453 tons a day against 2,546,261 tons in October, or 82,153 tons a day. This represents a falling off of 7700 tons a day, of which 7200 tons was in the output of the steel company furnaces and only 500 tons in that of merchant furnaces. There was a net loss of 17 furnaces in the month, the number active December 1 being 227 with a capacity of 71,686 tons a day, against 244 with a capacity of 78,558 tons a day on November 1. Production at the beginning of December was thus at the rate of 26,500,000 tons a year estimating charcoal iron at 335,000 tons.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from November, 1912, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons.	Steel Works.	Merchant.	Total.
November, 1912	62,817	24,878	87,695
December	63,770	25,996	89,766
January, 1913	63,921	26,251	90,172
February	64,005	28,364	92,369
March	61,448	27,699	89,147
April	64,658	27,101	91,759
May	64,232	26,807	91,039
June	62,002	25,617	87,619
July	59,362	23,239	82,601
August	59,140	22,981	82,121
September	60,941	22,590	83,531
October	59,630	22,503	82,133
November	52,434	22,019	74,453

Output by Districts

The accompanying table gives the production of all

coke and anthracite furnaces in November and the four months preceding:

Monthly Pig-Iron Production—Gross Tons.

	July (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)	Nov. (30 days)
New York	174,050	178,777	178,882	158,288	130,198
New Jersey	10,922	11,006	10,800	11,236	11,298
Lehigh Valley	79,942	80,921	79,217	82,304	78,046
Schuylkill Valley ..	76,400	58,692	52,328	53,130	52,297
Lower Susquehanna and Lebanon Val.	51,553	53,044	48,713	50,766	41,032
Pittsburgh district ..	559,275	571,007	587,122	640,819	579,366
Shenango Valley ..	145,834	136,297	143,322	142,136	111,802
Western Pennsylv'a.	139,787	143,169	136,343	132,898	132,029
Maryland, Virginia and Kentucky ...	60,187	56,986	52,139	60,426	54,378
Wheeling district ..	120,160	117,580	109,057	106,462	80,097
Mahoning Valley ..	257,092	264,648	270,104	278,428	244,870
Central and North- ern Ohio	230,203	239,050	222,930	228,619	169,213
Hocking Valley, Hanging Rock and S. W. Ohio ..	33,273	34,192	34,798	37,966	42,561
Chicago district ...	372,754	356,572	345,338	326,973	284,641
Mich., Minn., Mo., Wis., Col., Wash.	68,966	66,096	64,263	58,835	47,422
Alabama	160,564	164,236	157,254	161,365	160,011
Tennessee	19,684	13,490	13,317	15,610	14,342
Total	2,560,646	2,545,763	2,505,927	2,546,261	2,233,603

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.

	Fig. Total production			Spiegeleisen and ferromanganese		
	1911.	1912.	1913.	1911.	1912.	1913.
January	1,128,448	1,483,153	1,981,560	8,360	22,622	15,633
February	1,185,782	1,550,995	1,792,154	12,821	15,950	20,131
March	1,518,063	1,827,792	1,904,878	11,784	11,538	20,546
April	1,434,142	1,830,717	1,939,751	10,657	11,104	23,108
May	1,310,378	1,922,557	1,991,192	13,641	20,518	19,042
June	1,281,241	1,823,958	1,860,070	22,611	26,685	19,212
July	1,316,646	1,803,205	1,840,216	17,067	26,522	22,310
August	1,460,610	1,843,404	1,833,352	14,579	24,225	20,690
September	1,490,898	1,773,073	1,828,232	17,757	22,484	24,555
October	1,560,884	1,947,426	1,848,634	19,697	27,252	19,499
November	1,452,907	1,884,524	1,573,007	19,678	17,461	26,765
December	1,453,446	1,976,879	.....	20,068	18,523	.....

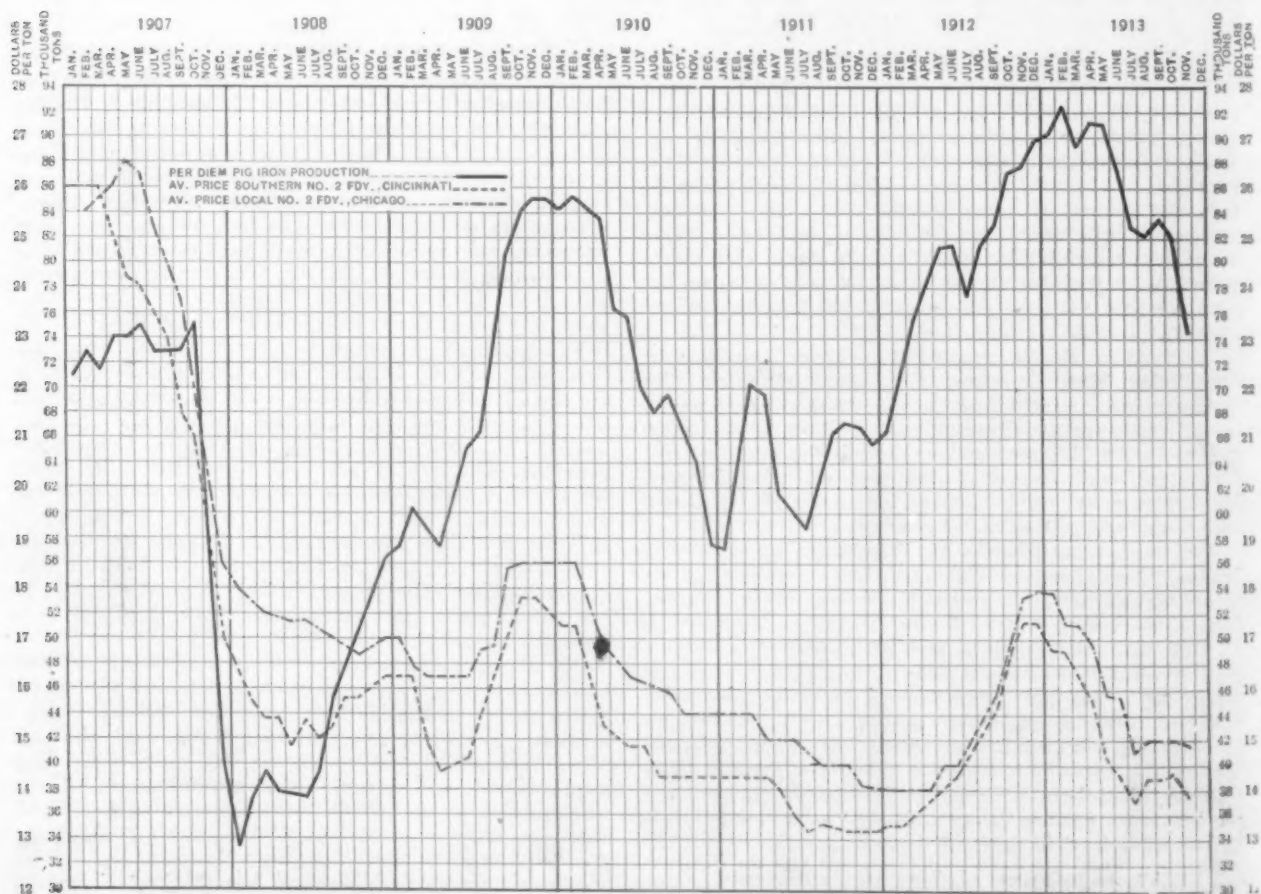


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to December 1, 1913; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Capacity in Blast December 1 and November 1

The following table shows the daily capacity, in gross tons, of furnaces in blast December 1 and November 1 by districts:

Location of Furnaces.	Coke and Anthracite Furnaces in Blast.				
	Total number of stacks.	Dec. 1 Number in blast.	Dec. 1 Capacity per day.	Nov. 1 Number in blast.	Nov. 1 Capacity per day.
New York:					
Buffalo	19	10	3,245	13	4,460
Other New York	7	2	356	2	364
New Jersey	7	2	377	2	362
Pennsylvania:					
Lehigh Valley	22	10	2,510	9	2,415
Spiegel	2	1	83	1	81
Schuylkill Valley	16	8	1,927	7	1,716
Lower Susquehanna ...	7	3	660	4	805
Lebanon Valley	10	4	561	4	643
Pittsburgh District ...	52	41	18,025	44	19,150
Spiegel	4	3	427	3	340
Shenango Valley	19	10	3,230	13	4,322
Western Pennsylvania ..	27	14	4,305	15	4,450
Maryland	4	2	575	3	894
Wheeling District	14	7	2,640	9	3,385
Ohio:					
Mahoning Valley	25	19	7,725	21	8,322
Central and Northern ..	24	17	5,618	19	7,141
Hocking Val., Hanging Rock, & S. W. Ohio ..	15	11	1,610	10	1,341
Illinois and Indiana ...	34	22	9,255	23	9,648
Spiegel	2	1	133	1	208
Mich., Wis. and Minn. ..	10	6	1,241	6	1,261
Colorado, Mo. & Wash. ..	8	1	339	1	350
The South:					
Virginia	24	8	931	8	860
Kentucky	5	1	120	2	315
Alabama	46	21	5,315	21	5,235
Tennessee	20	3	478	3	490
Total	423	227	71,686	244	78,558

Furnaces blown out in November include three Lackawanna in the Buffalo district, one Steelton (banked) in the Lower Susquehanna Valley, one Duquesne, one Edgar Thomson and one Isabella in the Pittsburgh district, one New Castle, Sharon and one Shenango in the Shenango Valley, one furnace of the Maryland Steel Company, Norton in Kentucky, one Mingo and Martin's Ferry (banked) in the Wheeling district, McKeefrey and one Ohio in the Mahoning Valley, Dover and one Lorain in Ohio, one South Chicago (Illinois Steel Company) and one Gary in the Chicago district, and Alabama City in Alabama.

The furnaces blown in last month include one Lock Ridge in the Lehigh Valley, Keystone in the Schuylkill Valley, one Madeline in the Chicago and one Pioneer in Alabama.

Diagram of Pig-Iron Production and Prices

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.							
	1907.	1908.	1909.	1910.	1911.	1912.	1913.
January	71,149	33,918	57,975	84,148	56,752	66,384	90,172
February	73,038	37,163	60,976	85,616	64,090	72,442	92,369
March	71,821	39,619	59,232	84,459	70,036	77,591	89,147
April	73,885	38,289	57,962	82,792	68,836	79,181	91,759
May	74,048	37,603	60,753	77,102	61,079	81,051	91,039
June	74,486	36,444	64,656	75,516	59,585	81,358	87,619
July	72,763	39,287	67,793	69,305	57,841	77,738	82,601
August	72,594	42,851	72,546	67,963	62,150	81,046	82,057
September	72,783	47,300	79,507	68,476	65,903	82,128	83,531
October	75,386	50,554	83,856	67,520	67,811	86,722	82,133
November	60,937	51,595	84,917	63,659	66,648	87,697	74,453
December	39,815	56,158	85,022	57,349	65,912	89,766	.....

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1908—Gross Tons.					
	1908.	1909.	1910.	1911.	1912.
Jan.	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911
Feb.	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815
Mar.	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318
April	1,149,602	1,738,877	2,483,763	2,064,086	2,375,436
May	1,165,688	1,883,330	2,390,180	1,893,456	2,512,582
June	1,092,131	1,930,866	2,265,478	1,787,566	2,440,745
July	1,218,129	2,103,431	2,148,442	1,793,068	2,410,889
Aug.	1,359,831	2,248,930	2,106,847	1,926,637	2,512,431
Sept.	1,418,998	2,385,206	2,056,275	1,997,102	2,463,839
Oct.	1,567,198	2,599,541	2,093,121	2,102,147	2,689,933
Nov.	1,577,854	2,547,508	1,909,780	1,999,433	2,630,854
Dec.	1,740,912	2,635,680	1,777,817	2,043,270	2,782,737

Blast Furnace Notes

The Keystone furnace of the Reading Iron Company, Reading, Pa., went into blast on November 26. While it was out of blast for repairs a complete system of stock handling equipment was installed, consisting of stock bins and trestles, skip hoist, etc. The stock bins and trestle piers are built of reinforced concrete similar in design to the bins at the Reading Iron Company's Crumwold furnace at Emaus, Pa. Frank C. Roberts & Co., Philadelphia, were the engineers in charge of the improvements.

Three furnaces of the Lackawanna Steel Company, Lackawanna, N. Y., were blown out in November—No. 5 on November 7 and Nos. 4 and 6 on November 22—leaving one furnace in blast December 1.

Two furnaces of the Maryland Steel Company were in blast on December 1, furnace A having been blown out November 14 for relining.

The furnace of the Standard Steel Company, at Alabama City, Ala., was blown out November 7.

In the Chicago district one South Chicago and one Gary furnace were blown out in November and one Madeline furnace of the Inland Steel Company was blown in, making a net loss of one for the month. On December 1 23 furnaces were in blast in the district.

Electric Production of Ferrochrome in Sweden

A new plant for the production of ferrochrome has just been started at Trollhättén, Sweden. Ores brought from South Africa and New Caledonia are to be reduced in two electric furnaces, now in operation, using 3-phase, 50-cycle current at a voltage varying between 45 and 60. Four grades of metal are being made and exported, according to the Daily Consular and Trade Reports, containing 5, 6½, 7½ and 9 per cent. of chromium. The process is secret and the manager, Louis Lucchèse, who is also the inventor, grants no admission to the works, since no patents have been applied for. The output for 1913 will reach about 1200 metric tons. The furnace is reported to require 1700 kw.-hr. per ton of metal produced and the results are said to be thus far very satisfactory. The works are owned by the Ferrolegeringer Aktiebolag.

Citizens of Sault Ste. Marie, Ont., have approved by a large majority a by-law giving a bonus to the Lake Superior Drydock & Construction Company, Ltd., promoted by F. W. Clergue. The company agrees to construct a ship-building plant within two years to cost \$1,500,000, paying the city \$25,000 for a site, the city to pay the company an annual bonus of \$20,000 for 20 years, the assessment of the property being fixed at \$500,000. The plant will be the largest in Canada and capable of constructing simultaneously two 15,000-ton and two canal size 230-ft. boats.

The directors of the American Steel & Wire Company are making their semi-annual inspection visit this week to the company's plants in the Cleveland, Pittsburgh and Chicago districts. The trip will include also the Southern plant, which is now about completed, at Fairfield, Ala., near Birmingham.

The American Steel Foundries has acquired the business and property of the Simplex Railway Appliance Company, Chicago, assuming all liabilities and the delivery of all orders now on the books. No changes in the management or personnel are announced at this time.

The Detroit Foundrymen's Association, Detroit, Mich., announces that at its meeting December 11 A. W. Moyer, Quigley Furnace & Foundry Co., New York City, will give an illustrated paper on "Core Ovens and Core-Oven Equipment."

Abendroth Brothers, Port Chester, N. Y., distributed 700 turkeys to their employees for Thanksgiving, and the recipients showed their appreciation by every man being at work the following day.

The Iron and Metal Markets

Pig Iron Follows Steel

A Sharp Curtailment in November

Lake Superior Iron Ore Shipments by Water, 49,070,500 Tons in 1913

The November pig-iron statistics show a sharp cutting down of the output of steel works blast furnaces in view of the curtailment in steel. For the 30 days the total was 2,233,603 gross tons, or 74,453 tons a day. In October it was 2,546,261 tons, or 82,153 tons a day. The steel works furnaces averaged 7200 tons a day less than in October, while the merchant furnace output declined only 500 tons a day. The November rate of production was the lowest since February, 1912.

There was a net loss of 17 furnaces in November. The 227 active December 1 had a daily capacity of 71,686 tons against 78,558 tons a day for 244 furnaces on November 1. Allowing 335,000 tons a year for charcoal iron, output on December 1 was at the rate of 26,500,000 tons a year. It was at 29,000,000 tons a year on November 1 and at 34,000,000 tons a year last February at the top of the late movement.

While the restriction of rolling mill output may already be more than equal to the falling off in the country's consumption, there is still a greater ingot production than the mills are working up, and it is expected that more blast furnaces will be put out this month. For some time the steel companies have been piling pig iron.

The Northern pig-iron market has been more active in the past week. Though many foundries have had to cut down forces the shipments of foundry pig iron are not greatly below the capacity of furnaces in blast. Northern iron has declined in some markets to the extent of 50 cents, and wherever buyers have been ready to take hold for the first quarter or first half of 1914 concessions have been made. Several good-sized inquiries have come out, but buying is not heavy as yet, though Buffalo put through a fair business.

The leanness in the steel trade is emphasized by the selling of 15,000 tons of basic pig iron in St. Louis by a Chicago district steel company, the first competition of the sort merchant furnaces have had in some years. At Pittsburgh a steel company has bought 4500 tons of basic iron at \$12.75 at Valley furnace.

The Southern pig-iron situation has not been altogether an open book. With a unanimity that has drawn the envy of Northern furnacemen Southern producers have been quoting \$11, Birmingham, for No. 2 foundry lately on the scattering early delivery business that has come up. This week at Cincinnati and in other Central territory several large lots have been quietly under negotiation for first quarter and first half of 1914 on a basis considerably below \$10.50, Birmingham, for No. 2 iron. At \$11, Alabama iron is more than \$1.50 a ton higher than current prices for Northern iron at some Ohio points.

Further reductions of running time by steel works have been made in the past week. The Carnegie Steel Company's Columbus, Ohio, steel works has been followed on the idle list by its open hearth plant at Sharon, and some curtailment at Ohio River points will come next. Throughout the industry ingot production is now estimated at 60 per cent. of capacity or less. The rail mill at Sparrows Point will be closed down for two or three weeks. Some of the smaller steel mills will probably be idle throughout the holidays.

In the Pittsburgh district a better inquiry in some finished lines has been noted, and as prices go lower

rather more resistance is shown to further decline. Yet there are no indications that free buying is at hand.

Railroad inquiry for track fastenings is better in the Chicago district. The Louisville & Nashville is in the market for 3500 tons of tie plates. The only considerable rail contract is one for 28,000 tons placed with the Tennessee Company by the Southern Pacific.

Plates are more commonly sold at 1.20c., Pittsburgh, and in the Central West this price has been shaded 50 cents a ton. Sales of bars in the Chicago district have been on a 1.20c. basis. Structural steel is held by most mills at 1.25c. on ordinary business, but they have gone lower on specially competitive contracts.

The Eastern tin plate market has been quite active in the past week, some good-sized contracts being closed, though at prices quite unsatisfactory to the mills.

Foreign ferromanganese makers announce a \$3 reduction this week, or to \$47, Baltimore.

The season's iron ore shipments from Lake Superior, which closed this week, show a total of 49,070,500 tons, one final cargo being estimated. If all-rail shipments in 1913 reach the 800,000-ton average of the past four years the total will be 49,870,000 tons, or much nearer the 50,000,000-ton mark than has been expected since the slump in the steel trade set in.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Dec. 3, 1913.	Nov. 26, 1913.	Nov. 5, 1913.	Dec. 4, 1912.
Pig Iron, Per Gross Ton:				
Foundry No. 2 X, Philadelphia.	\$15.50	\$15.50	\$15.75	\$18.50
Foundry No. 2, Valley furnace.	13.50	13.50	13.50	17.00
Foundry No. 2 S'th'n, Cin'ti.	14.25	13.75	14.25	17.25
Foundry No. 2, Birmingham, Ala.	11.00	10.50	11.00	14.00
Foundry No. 2, furnace, Chicago*	14.75	14.75	15.00	18.00
Basic, delivered, eastern Pa.	15.00	15.00	15.00	18.25
Basic, Valley furnace	12.75	12.85	13.25	16.50
Bessemer, Pittsburgh	15.90	15.90	16.15	18.15
Malleable Bessemer, Chicago*	14.75	14.75	15.00	18.00
Gray forge, Pittsburgh	14.15	14.25	14.25	17.15
Lake Superior charcoal, Chicago	15.25	15.25	15.25	18.75
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh	20.00	20.50	22.00	27.00
Open-hearth billets, Pittsburgh	20.00	20.50	22.00	27.50
Open-hearth sheet bars, P'gh.	21.00	21.00	22.00	28.00
Forging billets, Pittsburgh	24.00	26.00	26.00	34.00
Open-hearth billets, Philadelphia	22.50	22.90	23.50	32.00
Wire rods, Pittsburgh	25.50	25.50	26.00	30.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	13.50	13.50	13.50	18.00
Iron rails, Philadelphia	17.00	17.00	17.50	18.50
Carwheels, Chicago	12.00	12.00	12.00	17.00
Carwheels, Philadelphia	12.00	12.00	12.00	15.00
Heavy steel scrap, Pittsburgh	11.25	11.25	11.50	14.75
Heavy steel scrap, Philadelphia	10.00	10.00	10.50	15.00
Heavy steel scrap, Chicago	9.00	9.50	9.75	13.00
No. 1 foundry cast, Pittsburgh	12.00	12.00	12.00	14.50
No. 1 foundry cast, Philadelphia	12.50	12.50	13.00	15.00
No. 1 f'dry cast, Ch'go (net ton)	10.00	10.00	10.25	13.00
Finished Iron and Steel,				
Per Pound to Large Buyers:				
Bessemer rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.25	1.27½	1.32½	1.67½
Iron bars, Pittsburgh	1.35	1.40	1.45	1.65
Iron bars, Chicago	1.15	1.15	1.15	1.55
Steel bars, Pittsburgh	1.25	1.25	1.30	1.60
Steel bars, New York	1.41	1.41	1.46	1.76
Tank plates, Pittsburgh	1.20	1.25	1.30	1.70
Tank plates, New York	1.36	1.41	1.46	1.86
Beams, channels & angles, P'gh.	1.25	1.25	1.30	1.75
Beams, channels & angles, N. Y.	1.41	1.41	1.46	1.91
Skelp, grooved steel, Pittsburgh	1.25	1.25	1.30	1.45
Skelp, sheared steel, Pittsburgh	1.35	1.35	1.35	1.50
Steel hoops, Pittsburgh	1.45	1.45	1.50	1.50
Sheets, Nails and Wire,				
Per Pound to Large Buyers:				
Sheets, black, No. 28, Pittsburgh	1.90	1.95	2.00	2.25
Galvanized sheets, No. 28, P'gh.	2.90	2.95	3.00	3.40
Wire nails, Pittsburgh	1.55	1.55	1.60	1.70
Cut nails, f.o.b. Eastern mills	1.65	1.65	1.65	1.75
Cut nails, Pittsburgh	1.55	1.55	1.55	1.70
Fence wire, ann'd. 0 to 9, P'gh.	1.35	1.35	1.40	0.50
Barb wire, galv., Pittsburgh	1.95	1.95	2.00	2.10

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Pittsburgh

PITTSBURGH, PA., December 3, 1913.

For the first time in some weeks, several of the larger steel concerns report an increase in inquiry. This has not developed into more actual business, but indicates that the prices ruling are causing consumers to take more interest in the market. It is not believed that any increase in buying will take place this month but, on the other hand, it is likely December will show the low mark in rate of operations. A moderate buying movement is looked for early in January, but it will probably be largely for actual needs. Declines in prices in the past week have been slight, steel bars having settled down to about 1.25c., structural material 1.25c., plates 1.20c., No. 28 black sheets, 1.90c. and No. 28 galvanized 2.90c. It is conservative to state that the cost of making steel to-day, as compared with the low-price period in 1911, is fully \$1 a ton more. The Steel Corporation alone is paying in wages about \$1,000,000 a month more than it did in 1911, and basing its output when running full at 1,000,000 tons a month, this means an increase in wage cost alone of \$1 a ton. In 1911 steel bars sold at 1.05c. in large quantities, plates and shapes 1.10c. to 1.15c., and No. 28 black sheets 1.85c. Based on present cost, prices on finished material are nearly as low as they were in 1911, and it would seem they cannot go very much lower. The mills for the first time in some weeks are turning down business offered at prices which they will not accept, and if this is continued it will help to better the market. The statement is made that one large steel interest has indicated that 1.20c. on plates, 1.25c. on structural shapes and \$21 on sheet bars are its minimum prices and will not be shaded. Restriction in operations is still going on, and to-day steel production, based on ingot capacity, is not over 60 per cent. and may be slightly less. It is estimated that consumption is 70 per cent. of full capacity, and if this is true, it is ahead of output, which is bound to be felt before long. During the week the Sharon open-hearth works and blast furnace of the Carnegie Steel Company closed, making two steel plants, Columbus and Sharon, that are down. In the Pittsburgh district several Carnegie blast furnaces have gone out, but the rebuilt stack of the Clinton Iron & Steel Company will go in this week. Buying of track material, bridges and steel cars is at a low ebb, but after the first of the year is expected to be better. An inquiry from a leading Western road for 10,000 kegs of spikes for first quarter delivery is the first of this kind to come out in some months.

Pig Iron.—It develops that the total purchases of basic pig iron by the Colonial Steel Company last week amounted to 4500 tons, of which 1500 tons were for December delivery and 1000 tons a month for January-March. The business was taken by a Valley furnace interest at \$12.75 at furnace, or \$13.35 delivered at Colona, Pa. No large inquiries are in the market. While it is believed that prices on basic and foundry have about touched bottom, Bessemer is weak at \$15 at furnace. There has been a heavy reduction in the output of pig iron in the Central West, the Carnegie Steel Company alone having 20 furnaces idle out of a total of 58. W. P. Snyder & Co. of this city report the average price of Bessemer iron in November to have been \$15.125 and of basic \$13.013, both at Valley furnace, to which 90c. freight should be added for Pittsburgh delivery. These prices are based on sales of 10,000 tons of basic and 12,500 tons of Bessemer. The price on Bessemer was about 58c. less than the October average, and on basic about 69c. less than the October average. We note a sale of 1000 tons of forge for December and January shipment at \$13.25 at Valley furnace. We quote: Bessemer, nominally, \$15; basic, \$12.75; No. 2 foundry, \$13.50 to \$13.75; malleable Bessemer, \$13.50 to \$13.75; gray forge, \$13.25 to \$13.35, all at Valley furnace. The freight rate for delivery in the Pittsburgh or Cleveland district is 90c. a ton from Valley furnaces.

Billets and Sheet Bars.—Several of the leading makers have pegged prices on either Bessemer or open-hearth 4x4-in. billets at \$20 and sheet bars at \$21, f.o.b. maker's mill. It is probable that small lots of sheet bars for spot delivery might be bought from two or three of the outside mills at slightly lower prices. Consumers are willing to cover for first half at \$20 for billets and \$21 for bars, but the steel mills are not willing to sell so far ahead. We note sales of 1000 tons and of 1500 tons of Bessemer sheet bars for prompt delivery at \$21, maker's mill; also a sale of 800 tons of forging billets for reasonably prompt shipment at \$24, maker's mill. We quote Bessemer and open-hearth 4x4-in. billets at \$20 and Bessemer or

open-hearth sheet bars at \$21, Pittsburgh or Youngstown mills; forging billets, \$24, and axle billets, \$23, f.o.b. maker's mill, Pittsburgh.

Muck Bar.—The demand is quiet and prices are weaker. The Girard and East Youngstown puddling mills are now in operation to nearly full capacity and the supply is larger. We quote best grades, made from all pig iron, at \$30, Pittsburgh.

Steel Rails.—The leading railroads are slow in coming in the market for their 1914 rail requirements, but a number have asked the mills to reserve rolling space. A fair amount of business in standard sections is being placed in small lots up to 1000 tons. The new demand for light rails is active, the Carnegie Steel Company having booked new orders and specifications the past week for upward of 2000 tons. Light rails are being offered by rerolling rail mills at \$1.50 to \$2 under prices charged for rails rolled from billets. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Plates.—All the mills are badly in need of more work. Local steel car companies have placed some fair-sized orders, but business from boiler shops and other consumers is dull. No contracts for steel cars were announced the past week, and only two or three active inquiries are in the market. We quote ¼ in. and heavier plates on desirable orders at 1.20c. and small orders at 1.25c., maker's mill.

Structural Material.—The Fort Pitt Bridge Works of this city has been awarded the contract for the new Bloomfield bridge, requiring about 3500 tons of shapes, which will be rolled by the Carnegie Steel Company. Local work in the market includes new steel buildings for the Franklin Steel Works, Franklin, Pa., about 600 tons, and a new building for the H. J. Heinz Company, Pittsburgh, 800 tons. Bids have gone in on about 500 tons for the Magee Memorial Hospital, this city. Inquiries are fairly active, but mostly for small lots. We quote beams and channels up to 15 in. at 1.25c., Pittsburgh, on large lots, and 1.30c. on small lots. On very desirable business recently placed, the lower price was slightly shaded.

Wire Rods.—The dull conditions ruling in the wire trade are reflected in wire rods, the new demand for which is quiet, with specifications only fair. Not more than 50 per cent. of rod capacity is in operation at present. We quote Bessemer, open-hearth and chain rods at \$25.50, Pittsburgh, but on desirable business \$25 could be done.

Ferroalloys.—The consumption of ferromanganese has fallen off very much, owing to the fact that steel mills are not averaging over 50 to 60 per cent. of capacity. New inquiry is light, and only an occasional carload of ferromanganese is being sold for prompt delivery. Prices on English 80 per cent. ferromanganese have been reduced to \$47, Baltimore, the freight rate to Pittsburgh being \$2.16 per ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$75; over 100 tons to 600 tons, \$74; over 600 tons, \$73 Pittsburgh. We quote 10 per cent. ferrosilicon at \$22; 11 per cent., \$23, and 12 per cent., \$24, f.o.b. cars Jackson County, Ohio or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at \$25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Skelp.—The mills that roll for the open market have a fair amount of business on their books for delivery over the next two or three months, but there is not much new demand. It is reported that narrow grooved steel skelp in fairly large lots has sold at 1.20c. at mill. We quote grooved steel skelp at 1.25c. to 1.30c.; sheared steel skelp, 1.35c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.65c. to 1.70c., Pittsburgh.

Iron and Steel Bars.—Steel bars are in fairly active demand and specifications against contracts are being received in moderate volume. Some low prices have been made on steel bars for delivery to the Pacific coast and also to Eastern seaboard points, in competition with offerings of foreign bars. The mills rolling iron bars are badly in need of orders and prices are weak. We quote steel bars at 1.25c. to 1.30c. and iron bars 1.35c. to 1.40c., Pittsburgh.

Sheets.—The low prices now quoted are attractive to consumers and the volume of new business has shown material betterment the past week. The mills are being importuned by consumers to sell through first quarter and first half of next year at present prices.

but are refusing to do so. Sales of No. 28 Bessemer black sheets have been made for first quarter delivery at 2c. and No. 28 galvanized at 3c. A leading mill reports specifications heavier now than at any time for several months. As a rule, sheet mills are operating at 50 to 60 per cent. of capacity, most of them running three or four days and then shutting down for the remainder of the week. Others operate as full as possible one week, and then shut down the next. We quote Nos. 9 and 10 blue annealed sheets at 1.50c.; No. 28 Bessemer black, 1.90c. to 1.95c.; No. 28 galvanized, 2.90c. to 2.95c.; No. 28 tin mill black plate, H. R. and A., 1.90c., and Nos. 29 and 30 1.95c. for December shipment while for first quarter of 1914 the mills are holding No. 28 black sheets at 2c. and No. 28 galvanized at 3c. at maker's mill. These prices are f.o.b. Pittsburgh in carload and larger lots jobbers charging the usual advances for small lots from store.

Tin Plate.—A fairly large tonnage of tin plate is under contract for delivery next year, commencing with January, but some of the largest consumers have not yet covered. On a good part of the business placed the regular price of \$3.40 for 100 lb. cokes was obtained, but to the largest consumers the usual differentials of 5c. to 10c. per box were allowed. We quote 100-lb. cokes for ordinary lots at \$3.40 and 100-lb. ternes at \$3.30 per base box, f.o.b., Pittsburgh.

Spikes.—The Big Four Railroad has an inquiry out for 10,000 kegs of spikes for delivery in first half and other Western roads are inquiring for 3000 to 5000 keg lots for first quarter. These are the first large inquiries for railroad spikes that have come in the market for some time, but whether they will result in actual business remains to be seen. We quote railroad spikes in base sizes, $5\frac{1}{2} \times 9/16$ in., at \$1.50, and small railroad and boat spikes at \$1.55 to \$1.60 per 100 lb. f.o.b., Pittsburgh.

Bolts and Rivets.—Several makers report a perceptible increase in orders in the past week or two. Regular discounts on nuts and bolts are being shaded on desirable orders. We quote button-head structural-rivets at \$1.75 to \$1.80, and cone-head boiler rivets at \$1.85 to \$1.90, in large lots, an advance of about \$2 a ton over these prices being charged for small lots. Terms 30 days net, less 2 per cent. for cash in 10 days. The discounts on nuts and bolts are as follows: In lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws.....	.80 and 20% off
Small carriage bolts, cut threads.....	.75 and 17½% off
Small carriage bolts, rolled threads.....	.80 and 2½% off
Large carriage bolts.....	.70 and 15% off
Small machine bolts, cut threads.....	.80 and 2½% off
Small machine bolts, rolled threads.....	.80 and 7½% off
Large machine bolts.....	.75 and 10 and 2½% off
Machine bolts, with C.P.C. and T nuts, small,	70 and 12½% off
Machine bolts, with C.P.C. and T nuts, large,	70 and 12½% off
Square hot pressed nuts, blanked and tapped.....	\$.60 off list
Hexagon nuts.....	\$.67 off list
C.P.C. and R square nuts, tapped and blanked.....	\$.58 off list
Hexagon nuts, ¾ and larger.....	\$.68 off list
Hexagon nuts, smaller than 9/16.....	\$.74 off list
C.P. plain square nuts.....	\$.53 off list
C.P. plain hexagon nuts.....	\$.57 off list
Semi-finished hexagon nuts, ¾ and larger.....	.85 and 10% off
Semi-finished hex. nuts, smaller than 9/16.....	.85, 10 and 5% off
Rivets, 7/16 x 6½, smaller and shorter.....	.80 and 10% off
Rivets, metallic tinned, bulk.....	.80 and 10% off
Rivets, tin plated, bulk.....	.80 and 10% off
Rivets, metallic tinned, packages.....	.80 and 10% off
Standard cap screws.....	.75, 10, 10 and 7½% off
Standard set screws.....	.75, 10, 10 and 7½% off

Shafting.—Consumers are still buying only in small lots to cover current needs, and specifications against contracts from the larger consumers, especially the automobile builders, are unsatisfactory. The new demand for shafting is not more than 30 to 35 per cent. of capacity. We quote cold rolled shafting at 63 per cent. off in carloads and larger lots, but on desirable business, one or two points better would be named. Small lots are held at about 60 per cent. off, delivered in base territory.

Hoops and Bands.—Some fairly large contracts for hoops have lately been placed for delivery in first quarter, but the new demand for bands is quiet. We quote steel bands at 1.25c., with extras as per the steel bar card, and steel hoops 1.45c., maker's mill, Pittsburgh.

Wire Products.—All the mills are keen for business, with the result that competition is severe and hence prices are not being firmly maintained. The new demand is light. Specifications against contracts have fallen off so much that none of the wire mills is operating to full capacity. We quote wire nails to jobbers at \$1.55; cut nails, \$1.55; plain annealed wire, \$1.35; galvanized barb wire, \$1.95, and painted barb wire, \$1.55, f.o.b. Pittsburgh, per 100 lb., usual terms, actual freight added to point of delivery. We quote woven wire fence

ing at 74½ per cent. off in carload lots; 73½ per cent. off on 1000-rod lots, and 72½ per cent. on less than 1000-rod lots, all f.o.b. Pittsburgh.

Merchant Steel.—Shipments by the mills in November were lighter than in any one month for a long time. The new demand is only for small lots to cover current needs, while specifications against contracts are not heavy. Prices are shaded on desirable orders. We quote: Iron finished tire, $1\frac{1}{2} \times \frac{1}{2}$ in., and larger, 1.35c., base; under $1\frac{1}{2} \times \frac{1}{2}$ in., 1.50c.; planished tire, 1.55c.; channel tire, $\frac{3}{4}$ to $\frac{1}{2}$ and 1 in., 1.85c. to 1.95c.; $1\frac{1}{2}$ in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and $1\frac{1}{2}$ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Standard Pipe.—The inquiry for 40 miles of 12-in. pipe and 20 miles of smaller sizes sent out last week by a Texas natural gas company has not yet been placed. The present demand for lap and butt weld steel pipe is much better than usual at this season and the mills are fairly well filled for some months. The demand for oil-country goods is heavy, especially from Southwestern points, where a larger amount of new drilling is going on than usual. The new demand for iron pipe is good, one local mill having on its books all the business it can take care of up to February. Discounts on both iron and steel pipe are stated to be firmly held.

Boiler Tubes.—New orders are not heavy, and specifications from locomotive builders and boiler shops have fallen off materially. The railroads are buying little, and all the makers of boiler tubes are short of business and are not operating to full capacity.

Iron and Steel Scrap.—Nearly all consumers are holding up shipments as much as possible, until after the first of the coming year, and there is little new buying. Dealers realize that it would be unwise to try to force sales this month. Leading consumers of borings and turnings are pretty well filled up. In fact, little scrap of any kind is moving. We note a sale of 300 tons of cast-iron borings at about \$7.50 and 200 tons of turnings at about \$6.75, delivered buyer's mill in the Pittsburgh district. Dealers are quoting about as follows per gross ton for delivery in the Pittsburgh and other districts:

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery.....	\$11.25 to \$11.50
Compressed side and end sheet scrap.....	10.25
No. 1 foundry cast.....	12.00 to 12.25
No. 2 foundry cast.....	10.75 to 11.00
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district.....	6.50 to 6.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.....	13.50 to 13.75
No. 1 railroad malleable stock.....	11.25 to 11.50
Grate bars.....	7.50 to 7.75
Low phosphorus melting stock.....	14.00 to 14.25
Iron car axles.....	24.25 to 24.75
Steel car axles.....	17.25 to 17.50
Locomotive axles, steel.....	20.75 to 21.25
Locomotive axles, iron.....	25.25 to 25.75
No. 1 busheling scrap.....	11.25
No. 2 busheling scrap.....	7.00
Machine shop turnings.....	6.50 to 6.75
Old carwheels.....	13.00 to 13.25
*Cast-iron borings.....	7.25 to 7.50
†Sheet bar crop ends.....	13.50 to 13.75
Old iron rails.....	14.25 to 14.50
No. 1 railroad wrought scrap.....	13.50 to 13.75
Heavy steel axle turnings.....	8.75 to 9.00
Stove plate.....	7.50 to 7.75

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Coke.—Negotiations are under way for a large tonnage of blast furnace coke for delivery in first half. On standard grades, makers are asking \$1.85 to \$1.90 on contracts for first half, but furnacemen contend that these prices are too high, considering the low market on pig iron. The demand for furnace coke for prompt shipment is dull, consumption having been materially restricted by the blowing out of so many blast furnaces. The demand for foundry coke is quiet. We quote strictly standard blast furnace coke for December shipment at \$1.75 to \$1.80 per net ton at oven, and for first half of the year delivery at \$1.85 to \$1.90, but some makers are holding furnace coke for first half delivery at \$2. We quote best grades of 72-hr. foundry coke to consumers at \$2.50 to \$2.65 per net ton at oven. The output of coke in the Upper and Lower Connellsville regions last week is given by the Connellsville Courier as 355,240 tons, an increase over the previous week of nearly 19,000 tons.

Chicago

CHICAGO, ILL., December 3, 1913.—(By Telegraph.)

Among iron and steel products pig iron alone offers any substantial prospect of a nearby period of general trading. Even this prospect is colored somewhat by reports of negotiations more advanced in other districts in the Central West than at Chicago. The influence of large sales of Southern iron quietly made elsewhere at prices that tend to mark a turning point will affect the local situation none the less, even though inquiry here is still comparatively light and sales even more scarce. The sale of 15,000 tons of basic iron by a Chicago furnace to a St. Louis interest has considerably less bearing upon the Northern market than if this tonnage had been placed on the books of a merchant furnace. A break in the disinterested attitude of the railroads, from which a small ray of hope is taken, came last week in the form of a quite general inquiry for track fastenings, prominent among which was 3500 tons of tie plates for the Louisville & Nashville Railroad. On the belief that the railroads must soon buy, perforce, some 3,000,000 to 4,000,000 tons of material rests in largest measure the hope of an early resumption of normal activity. Prices for the regular lines of finished steel materials have not undergone any radical change during the week. Further recession has been confined to the placing of an increasing proportion of business at minimum prices previously noted. Plates and steel bars are more freely obtainable at 1.38c., Chicago, and structural shapes at 1.43c., although sales in small lots, which are characteristic of present transactions, continue to be made at prices as high as 1.48c. Sheets likewise continue to feel the pressure of liquidation, and for shafting, rivets and other of the lesser products declining values are the rule. Unusual interest attaches to the prices now current for old materials, in that they represent new low levels for at least the past 20 years in this market and perhaps for a much longer period. The scrap market is also different in that the low level beyond which prices are unlikely to sink is still entirely indefinite.

Pig Iron.—Inquiry for pig iron the past week has been larger in volume and more general as regards Northern and Southern irons. This inquiry still lacks that desirable characteristic which gives promise of early closing for definite tonnage. The situation has accordingly lacked the pressure necessary to establish a real trading basis, and \$11, Birmingham, continues the prevailing quotation. The Commonwealth Steel Company, St. Louis, whose inquiry for 6000 tons of basic was noted last week, has closed for 15,000 tons at a price understood to be less than \$14. Chicago furnace. The fact that this and other basic tonnage placed during the past week will be furnished by a steel company rather than by one of the local merchant furnaces removes much of the market significance from the transaction and fails to add strength to the market on other merchant grades of iron. Sales of foundry and malleable Bessemer iron have been of insufficient tonnage to make the matter of price a critical question, and quotations for standard grades in this market continue unchanged. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4....	\$15.25 to \$15.75
Northern coke foundry, No. 1.....	15.00 to 15.50
Northern coke foundry, No. 2.....	14.75 to 15.00
Northern coke foundry, No. 3.....	14.25 to 14.75
Southern coke No. 1 foundry and No. 1 soft.....	15.60 to 16.15
Southern coke, No. 2 foundry and No. 2 soft.....	15.10 to 15.60
Southern coke, No. 3.....	14.60 to 15.10
Southern coke, No. 4.....	14.10 to 14.60
Southern gray forge.....	14.10 to 14.60
Southern mottled.....	13.60 to 14.10
Malleable Bessemer.....	14.75 to 15.00
Standard Bessemer.....	17.65
Basic.....	14.00 to 14.50
Jackson Co. and Kentucky silvery, 6 per cent.....	18.40
Jackson Co. and Kentucky silvery, 8 per cent.....	19.40
Jackson Co. and Kentucky silvery, 10 per cent.....	20.40

(By Mail)

Rails and Track Supplies.—Inquiry from a number of railroads covering angle bars, spikes, bolts and tie plates was one of the few features of the week which can be reported with some cheerfulness but this was the only break in the suspended activities of these railroads. No purchases of interest for right-of-way were reported. The general feeling prevails that the resumption of buying by the railroads will be followed by a favorable turn in the general market and the hopes of those who look for better conditions early in 1914 are based upon railroad needs aggregating from 3,000,000 to 4,000,000

tons, the covering of which cannot be avoided it is believed. We now quote standard railroad spikes at 1.65c. to 1.70c., base; track bolts with square nuts, 2.10c. to 2.15c.; base, all in carload lots, Chicago; tie plates, \$30 to \$32 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Prices rather than tonnage are the matters of interest in the local structural market. The concessions from the basis of 1.30c., Pittsburgh, for plain shapes are magnified into striking irregularities and very low prices for fabricated steel. Among the contracts placed during last week was 1740 tons for the Hobart Estate office building at San Francisco, awarded to Milliken Bros.; 560 tons for general renewal work for the Missouri Pacific Railway Company placed with the American Bridge Company, which also took 153 tons for a girder span for the Chicago, Milwaukee & St. Paul Railway Company. The Morava Construction Company will fabricate 231 tons for the Chicago & Western Indiana Railroad Company. The Omaha Structural Steel Company sublet 170 tons of plate girders. It is reported that the general contract for the Missouri State Capitol has been let, carrying with it requirements aggregating 5000 tons of steel. For structural material from mill the ruling quotation continues on the basis of 1.30c., Pittsburgh, but desirable tonnage has brought out competitive prices \$1 a ton lower. In this respect conditions have changed little from those prevailing a week ago. We quote for Chicago delivery from mill 1.43c. to 1.48c.

The demand for material from store is dull and without feature, and we continue to quote for Chicago delivery 1.85c.

Plates.—The buying of cars is again at a low ebb. The Chicago Elevated Railways will increase its proposed purchase of steel cars from 100 to 120. The Missouri, Kansas & Texas Railroad has bought 200 ballast cars and is understood to have an inquiry out for 1000 stock cars. During the week one of the western car builders was also in receipt of an order for 500 cars. The Chicago Junction Railway is buying eight locomotives and the Kanawha & Michigan Railroad seven locomotives to be built by the American Locomotive Company. Except that an increasing proportion of the limited business offering in sheared plates is being placed at the 1.38c. Chicago price market conditions have not changed much in the past week and we quote for Chicago delivery from mill 1.38c. to 1.48c.

From store we continue to quote for Chicago delivery 1.85c.

Sheets.—The limit to which the liquidation of sheet values can be carried continues to be severely tested under the pressure of competition and during the past week quotations have again been pushed down to slightly lower levels. At Chicago 2.08c. can now be done on black sheets and 3.08c. on galvanized. Inquiry while somewhat better than in other lines is much below normal. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.68c. to 1.73c.; No. 28 black, 2.08c. to 2.13c.; No. 28 galvanized, 3.08c. to 3.13c.

Reports on prices made for sheet business out of store indicate that even for the smaller orders minimum prices are necessary in order to take the business and not infrequently freight differences are absorbed making the quotations referred back to basing point somewhat lower than regular quotations. For Chicago delivery we quote No. 10 blue annealed, 1.95c. to 2.05c.; No. 28 black, 2.55c. to 2.65c.; No. 28 galvanized, 3.60c. to 3.70c.

Bars.—The disposition to justify quotations for steel bars on a basis as low as those for plates by at least one mill is occasioning some irregularity from the otherwise fairly consistent maintenance of quotations between 1.25c. and 1.30c., Pittsburgh. In the absence of any very attractive new business the real bottom of the market can only be surmised. Bar iron continues to be offered in moderate quantity, but with less of the business going at prices as high as 1.20c., Chicago. We quote for mill shipment as follows: Bar iron, 1.15c. to 1.20c.; soft steel bars, 1.38c. to 1.48c.; hard steel bars, 1.35c. to 1.40c.; shafting in carloads, 60 to 65 per cent. off; less than carloads, 55 to 60 per cent. off.

Store prices for iron and steel bars for Chicago delivery are: Soft steel bars, 1.75c.; bar iron, 1.75c.; reinforcing bars, 1.75c. base, with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over, and usual card extras for smaller sizes; shafting 55 to 57 per cent. off.

Rivets and Bolts.—Quotations for both rivets and bolts cover so wide a range of concessions made to fit each order that quoted prices are largely nominal. We quote from mill as follows: Carriage bolts up to $\frac{3}{8}$ x 6 in., rolled thread, 80-2½; cut thread, 75-17½; larger sizes, 70-15; machine bolts up to $\frac{3}{8}$ x 4 in., rolled thread, 80-7½; cut thread, 80-2½; large size, 75-2½; coach screws, 80-10-10; hot pressed nuts, square head, \$6 off per cwt.; hexagon, \$6.70 off per cwt. Structural rivets

$\frac{1}{2}$ to $1\frac{1}{4}$ in., 1.88c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets, 2.40c., and for boiler rivets, 2.60c. Machine bolts up to $\frac{3}{8}$ x 4 in., 70-5-10; larger sizes, 70-7 $\frac{1}{2}$; carriage bolts up to $\frac{3}{8}$ x 6 in., 75-5; larger sizes, 70-7 $\frac{1}{2}$ off. Hot pressed nuts, square head, \$5.50, and hexagon, \$6.20 off per cwt.

Wire Products.—The moderate weather conditions which have prevailed beyond their usual season have aided in the maintenance of a fair volume of shipments of wire products. Even this advantage has not been sufficient, however, to place the trade on a basis so favorable as to eliminate price irregularities. What were concessions of \$1 a ton are now an accepted reduction in price. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, \$1.53 to \$1.58; wire nails, \$1.73 to \$1.78; painted barb wire, \$1.73 to \$1.78; galvanized, \$2.10 to \$2.15; polished staples, \$1.73 to \$1.78; galvanized, \$2.05 to \$2.10, all Chicago.

Cast-Iron Pipe.—The prospective awards of 450 tons of water pipe at Mt. Ayr, Iowa, and of 600 tons at Olathe, Kan., have hardly disturbed the otherwise unbroken monotony of the pipe trade in this the out-of-season period. Orders for gas pipe are still lacking. We revise our quotations and quote as follows, per net ton, Chicago: Water pipe, 4 in., \$27; 6 to 12 in., \$25; 16 in. and up, \$24, with \$1 extra for gas pipe.

Old Material.—The prices at which scrap in this market is now changing hands are establishing new low levels within the memory of the present operators. Until now \$9.50 per gross ton has been recognized as a bottom price for heavy melting steel scrap in this market. To-day's quotations are 50c. per ton lower. No. 1 railroad wrought has also fallen below the \$9 mark and cast borings are down to the surprising level of \$4 per ton with little or no demand. In addition to the lack of demand the market this week has bearing down upon it the weight of scrap offerings from the Atchison, Topeka & Santa Fé Railroad, aggregating 10,000 tons, and from the Chicago & Northwestern 6000 tons. There is no doubt that every effort will be made by these railroads to dispose of this tonnage. Among the items listed are 1500 tons of old steel rails less than 5 ft. and 3000 tons of No. 1 railroad wrought. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	\$13.50 to \$14.00
Old steel rails, rerolling	11.50 to 12.00
Old steel rails, less than 3 ft.	11.00 to 11.50
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	12.00
Heavy melting steel scrap	9.00 to 9.50
Frogs, switches and guards, cut apart.	9.00 to 9.50
Shoveling steel	8.50 to 9.00
Steel axle turnings	6.50 to 7.00

Per Net Ton.

Iron angles and splice bars	\$11.75 to \$12.25
Iron arch bars and transoms	11.75 to 12.25
Steel angle bars	8.25 to 8.75
Iron car axles	17.50 to 18.00
Steel car axles	12.25 to 12.75
No. 1 railroad wrought	8.50 to 8.75
No. 2 railroad wrought	8.00 to 8.25
Cut forge	8.00 to 8.25
Steel knuckles and couplers	8.75 to 9.25
Steel springs	9.25 to 9.75
Locomotive tires, smooth	10.50 to 11.00
Machine shop turnings	4.25 to 4.50
Cast borings	4.00 to 4.25
No. 1 busheling	7.50 to 8.00
No. 2 busheling	6.00 to 6.25
No. 1 boilers, cut to sheets and rings.	6.00 to 6.50
Boilers punchings	10.25 to 10.75
No. 1 cast scrap	10.00 to 10.50
Stove plate and light cast scrap	9.25 to 9.75
Railroad malleable	9.00 to 9.50
Agricultural malleable	8.00 to 8.50
Pipes and flues	6.75 to 7.00

Philadelphia

PHILADELPHIA, PA., December 2, 1913.

Specifications against contracts have been a trifle better in some products, sufficient to keep plants in operation that had been threatened with shutting down, but new business continues exceedingly light. Under existing conditions, consumers see little prospect of an upward movement and are content to wait until a firm low level has been reached. The movement in pig iron has not been sufficient to test the market. No further sales of foreign low phosphorus iron have been made, although available at \$21 delivered at nearby points. Heavy plates are somewhat easier, and in extreme cases 1.35c. delivered here has been done. Iron bars are weaker. Basic open-hearth rolling billets can be had at

\$22.50 here. The coke market is quiet. Old material is inactive and prices are weak.

Iron Ore.—Business is still lacking. The week's importations were confined to 7502 tons of Swedish and 4600 tons of Cuban ore.

Pig Iron.—Buying could scarcely be smaller. Consumers hold off awaiting lower levels before coming into the market. Sellers, on the other hand, finding prices at the cost line, resist further concessions. More curtailment of production is in sight, several makers stating that they will blow out rather than pile iron. In the absence of demand from the larger consumers, prices have not been seriously tested. Small sales of standard brands of No. 2 X eastern Pennsylvania foundry continue to be made at \$15.50 to \$15.75 delivered in this district, although less desirable brands, such as irons with mill cinder mixtures, can be had at \$15.25. A factor of interest is the reported offerings of Buffalo No. 2 X foundry for shipment into this district, at \$15.45 delivered, equal to \$13, Buffalo. This is construed as an effort to break into a territory not heretofore considered a market for Buffalo irons. Outside of an occasional small lot, there is little inquiry for the higher foundry grades for extended shipment, practically all the demand being for spot or 30 to 60 days' delivery. One sale of 300 tons of Virginia foundry for first quarter is noted. Notwithstanding rumors of concessions, prices are being well maintained at \$13 for 2 X and \$12.75 for 2 plain at Virginia furnace. Cast-iron pipe makers who have recently been negotiating for round lots for early 1914 shipment have, it is reported, decided to await developments before placing orders. Rolling mill forge iron is comparatively quiet, following recent sales at \$14.75 delivered. Outside of several moderate sales of low phosphorus pig iron, the demand for steel making grades is lacking. Foreign low phosphorus at \$21, delivered at nearby points has been offered against several inquiries in this district, but no sales have resulted. Several hundred tons of domestic 0.035 phosphorus iron have been sold under \$21.50, probably at \$21 delivered, while moderate sales of 0.030 have been made at \$22 delivered here. Small sales of Lebanon low phosphorus continue to be made at \$18 at furnace. No further inquiry for basic, which is nominally quoted at \$15 delivered, has come out. Furnaces report curtailment of shipment by some consumers of basic. Reports of requests for deferred shipments in foundry grades are also beginning to be heard. The following range of prices is named for current small transactions, covering either prompt or near future delivery, in buyers' yards in this vicinity:

Eastern Pennsylvania No. 2 X foundry.	\$15.50 to \$15.75
Eastern Pennsylvania No. 2 plain.	15.25 to 15.50
Virginia No. 2 X foundry.	15.80 to 16.00
Virginia No. 2 plain	15.55 to 15.75
Gray forge	14.75
Basic (nominal)	15.00
Standard analysis low phosphorus.	22.00

Ferroalloys.—The market is quiet. Small sales of English 80 per cent. ferromanganese have been made at \$50, seaboard, and German at about \$1 lower for prompt shipment. There is practically no demand for forward ferromanganese. Importations of ferromanganese at this port last week aggregated 377 tons. The demand for ferrosilicon is light. One carload of 11 per cent. is reported sold at a slight concession.

Later.—Cable advices report a reduction of \$3 on English ferromanganese, making the new price \$47, seaboard.

Billets.—Eastern mills continue to operate at about one-third capacity and expect sufficient specifications to enable them to operate until December 20, when unless new business develops they will shut down for the holidays. Inquiry is light, new orders being confined to occasional small lots for early delivery. Quotations are largely nominal, but for any reasonable order \$22.50, delivered, can be done for basic open-hearth rolling billets, ordinary analysis forging steel commanding from \$26.50 to \$27.50 according to specification.

Plates.—While mills have been receiving a few more orders they have mostly been small. In instances specifications have been heavier, but there is little change in mill operations. The absence of railroad buying is being keenly felt. Considerable business in ship plates is before the trade, but closes slowly, awaiting a more stable price level. Small sales continue to be made at 1.40c. to 1.45c., delivered in buyers' yards, but when competition is sharp down to 1.35c., delivered, has been done.

Structural Material.—The demand for miscellaneous small lots is reported lighter, while the volume of larger work is unimportant. Some considerable tonnage in

track elevation work is ahead. A local fabricator has a contract for some 500 tons for a building in another Eastern city, while some small bridge work has also been given out. Prices continue weak, but on the small miscellaneous orders which make up the bulk of the buying 1.40c. to 1.45c., delivered in this vicinity, about represents the market.

Sheets.—Orders are usually small and for prompt delivery. Eastern mills are still running close to full capacity, having about three days' work ahead, and as a rule accumulate stock each week. A number of these mills are planning to shut down December 20 for the holidays. Prices continue irregular, and while 1.60c. to 1.65c., delivered, represents quotations for No. 10 blue annealed sheets concessions are made for desirable orders.

Bars.—New business in both iron and steel bars has been very light. Steel bar makers are receiving better specifications on contracts taken at higher prices, on which readjustments meeting current quotations are made. Makers of iron bars are feeling the effect of reduced orders, and price concessions are in instances being made. Ordinary iron bars are reported available at 1.25c. to 1.32½c., delivered, although the better grades command up to 1.37½c. Steel bars are being held at 1.45c., delivered, but are not considered strong on that basis.

Coke.—Small sales of prompt furnace coke have been made at \$1.75 to \$1.90, at oven, dependent on the quality. Buyers and sellers are still apart on prices of forward furnace coke and no business has been reported. Moderate sales of foundry coke are being made at unchanged prices. The following range of quotations, per net ton, is named for delivery in buyers' yards in this district:

Connellsville furnace coke.....	\$3.90 to \$4.40
Connellsville foundry coke.....	4.90 to 5.35
Mountain furnace coke.....	3.70 to 4.10
Mountain foundry coke.....	4.60 to 4.85

Old Material.—Most buyers are inclined to withhold purchases until after the turn of the year, being well supplied with stocks. Consumers of No. 1 heavy melting steel show no interest in the market; transactions between dealers have been made at \$10.25, delivered. Railroad lists of old material are about the average, but lower prices are expected to rule. Heavy steel continues to move to the West, where better prices are obtainable. Rolling-mill grades are particularly quiet. Quotations are largely nominal, the following range about representing prices at which business could be done, delivered in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel.....	\$10.00 to \$10.25
Old steel rails, rerolling (nominal).....	12.50 to 13.00
Low phosphorus heavy melting steel scrap (nominal).....	14.00 to 14.50
Old steel axles (nominal).....	15.75 to 16.00
Old iron axles (nominal).....	21.00
Old iron rails (nominal).....	17.00
Old carwheels.....	12.00 to 12.50
No. 1 railroad wrought.....	12.75 to 13.25
Wrought-iron pipe.....	8.50 to 9.00
No. 1 forge fire.....	7.50 to 8.00
No. 2 light iron (nominal).....	5.00
No. 2 busheling (nominal).....	7.50 to 8.00
Wrought turnings.....	7.00 to 7.50
Cast borings.....	7.50 to 8.00
Machinery cast.....	12.50 to 13.00
Grate bars, railroad.....	9.00 to 9.50
Stove plate.....	9.50 to 10.00
Railroad malleable (nominal).....	10.00 to 10.50

Cleveland

CLEVELAND, OHIO, December 2, 1913.

Iron Ore.—The ore-shipping season closed with the dispatch of a few cargoes early this week. All the shippers with one exception finished in November. Lake shipments of coal and grain will continue during the remainder of this week. The past season has been a remarkably good one for the merchant ore firms, this being especially noteworthy when conditions in the ore trade are compared with what have prevailed in the pig iron and steel industry during the past few months. A very heavy tonnage was sold during the buying movement late in 1912 when there was no indication of the falling off in business that came on this year and these sales were made at an advance in prices ranging from 55c. to 65c. a ton over 1911. About the only effect the slump in business had on ore sellers this year was that some additional buying that was expected during the summer did not materialize. Some furnace interests did not cover for all their expected requirements at the time of the buying movement and

because of the falling off in consumption did not need to place orders for additional ore. We quote prices as follows: Old range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; old range non-Bessemer, \$3.50; Mesaba non-Bessemer, \$3.40.

Pig Iron.—Prices on Northern foundry iron for Cleveland delivery have declined 50c. a ton. No. 2 foundry is now quoted by one producer at \$13.50 at furnace for local delivery as well as for outside shipment. This price would probably be made for delivery through the first quarter. The low prices, however, are bringing out very little business and furnacemen do not expect much activity during December in spite of the fact that little iron has been sold for delivery after January 1. That the melt will further fall off is indicated by the fact that some foundries that have been quite busy up to the present time have few orders ahead. Southern iron is generally held at \$11, Birmingham, for No. 2, but some buyers have been asked to submit offers at \$10.75. We quote, delivered Cleveland, as follows:

Bessemer.....	\$15.90
Basic.....	13.90
Northern No. 2 foundry.....	\$13.75 to 14.25
Southern No. 2 foundry.....	15.10 to 15.35
Grey forge.....	13.50
Jackson County silvery 8 per cent. silicon.....	18.55

Coke.—The market is quiet. Some inquiry has come out for furnace coke contracts for the first half, but some producers are refusing to meet the prices at which sales are reported to have been made. Standard 72-hour foundry coke is quoted at \$2.50 to \$2.75 per net ton at oven, but higher prices are being asked by some makers. Standard furnace coke is quoted at \$1.75 to \$1.85 for spot shipment.

Old Material.—There is some demand for small lots which are moving at the prevailing low prices. Mills are buying only for their early needs. An interesting feature of the market is that producers generally, instead of holding their scrap for better prices, are letting it go for what they can get. The same is largely true of dealers. While the consumption has fallen off materially the production now appears to have fallen off in nearly the same proportion. Prices are weak, but quotations are unchanged except on busheling, which has declined about 25c., local mills having bought at \$8 per net ton. Railroad lists in dealers' hands include the Pennsylvania Railroad, to be closed Tuesday; the Pennsylvania Company, to be closed Wednesday, and the Wheeling & Lake Erie, to be closed Thursday. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling.....	\$12.00 to \$12.50
Old iron rails.....	12.50 to 13.00
Steel car axles.....	16.50 to 17.00
Heavy melting steel.....	9.25 to 9.50
Old carwheels.....	11.50 to 12.00
Relaying rails, 50 lb. and over.....	23.00 to 25.00
Agricultural malleable.....	9.00 to 9.50
Railroad malleable.....	10.00 to 10.50
Light bundled sheet scrap.....	6.50 to 7.00
Bundled tin scrap.....	11.00 to 11.50

Per Net Ton.

Iron car axles.....	\$18.00 to \$19.00
Cast borings.....	5.50 to 5.75
Iron and steel turnings and drillings.....	4.25 to 4.50
Steel axle turnings.....	5.75 to 6.00
No. 1 busheling.....	8.00 to 8.25
No. 1 railroad wrought.....	9.50 to 10.00
No. 1 cast.....	10.50 to 11.00
Stove plate.....	8.00 to 8.50

Finished Iron and Steel.—New demand continues light with orders only for small lots for early delivery. Buyers are doing more shopping around than usual to get the lowest prices, and quotations generally are about \$1 a ton lower than a week ago. Unless quick delivery is wanted many small orders that usually go to warehouses are being placed with the mills so that warehouse business is particularly dull. The Cleveland consumer, who has been trying to contract for about 5000 tons of billets at \$20 delivered, has not yet placed the order, being so far unable to buy at that price. A Cleveland mill has bought 1000 tons of sheet bars at slightly under \$21. Some forging billets have been sold at \$25 Pittsburgh. On steel bars the 1.25c. Pittsburgh quotation has become quite general. The minimum quotation on plates is 1.20c. Pittsburgh. A recent order for 575 tons of plates that was reported placed at 1.17½c. was not taken by a Cleveland mill, as was generally reported at the time. Structural material is quoted at 1.25c. to 1.30c. Pittsburgh. There is a local inquiry, but the business has not yet been placed, for 1000 tons of steel for two ore bridges. This includes 800 tons of structural material and 200 tons of plates and bars. The minimum flat quotation

made on this inquiry is 1.25c. An addition to the Bourne-Fuller Company's warehouse will require 400 to 500 tons of steel. The American Shipbuilding Company is in the market for about 3500 tons of plates and structural material for a new boat. The demand for iron bars is light and prices are weak. We quote iron bars at 1.20c. to 1.30c. Cleveland mill, but the former price might be shaded for outside delivery. Quotations by other mills as low as 1.12c. are reported. Minimum quotations on sheets are unchanged at 1.90c. for No. 28 black, 2.90c. for No. 28 galvanized and 1.45c. for No. 10 blue annealed for early delivery. Rivets are quoted at 1.75c. Pittsburgh for structural and 1.85c. for boiler for carloads. Warehouse prices are unchanged at 1.90c. for steel bars and 2c. for plates and structural material.

Cincinnati

CINCINNATI, OHIO, December 3, 1913.—(By Telegraph.)

Pig Iron.—The dullness that has so long characterized this market is more pronounced. Shipments on contracts are moving at a fairly satisfactory rate, but buyers are slow to make fresh purchases. It is rumored that several large consumers of foundry iron are on the verge of covering for future requirements. The smaller consumers are more willing to consider offers, but so far they have not been able to agree with the sellers on prices, and are only contracting for immediate requirements. Probably the largest sale reported last week was 400 tons of Southern No. 2 foundry iron for delivery during the next four months, made at \$11, Birmingham basis. No quotation below this figure is available here, and while it is problematical as to what would be accepted in case the tonnage was attractive, it is hardly probable that any standard brands could be purchased below this price, even for nearby shipment. As far as can be ascertained, there is no basis for the rumor that No. 2 Southern foundry is being offered as a No. 3 grade in order to bring out business. The general opinion is that price inducements would be futile, and local agencies appear to have settled down, adopting the same waiting attitude that buyers had previously assumed. Prices on Northern foundry and basic are soft and \$13.50, Iron-ton, can be done for shipment through the first half. There has been some activity in Ohio silvery, but the total tonnage is small. No confirmations have been received as to malleable sales in other territory further than a small lot taken by a St. Louis melter. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Iron-ton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft..	\$14.75 to \$15.25
Southern coke, No. 2 foundry and 2 soft..	14.25 to 14.75
Southern coke, No. 3 foundry	13.75 to 14.25
Southern, No. 4 foundry	13.25 to 13.75
Southern gray forge	12.75 to 13.25
Ohio silvery, 8 per cent. silicon.....	18.20 to 18.70
Southern Ohio coke, No. 1	15.70 to 16.20
Southern Ohio coke, No. 2	14.70 to 15.20
Southern Ohio coke, No. 3	14.45 to 14.70
Southern Ohio malleable Bessemer	15.20 to 15.45
Basic, Northern	15.20 to 15.45
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(By Mail)

Coke.—A very light demand is found for both furnace and foundry coke, although several furnace operators are said to be more interested in the market than for some time. The general opinion of the trade is that buying will continue of a hand-to-mouth character for the remainder of the month, probably extending through January. Connellsville prices are unchanged, although a few operators have made an effort to mark up quotations on contract business. Prompt Connellsville furnace coke is quoted all the way from \$1.80 to \$2 per net ton at oven, with the majority of producers asking the higher figure for first half. Both prompt and contract foundry coke ranges from \$2.50 to \$2.90 per net ton at oven, and a number of sellers are unwilling to take less than \$3, but as far as is known no contracts are being made at this price. The same prices and conditions practically rule in the Wise County and Pocahontas districts, with possibly a firmer attitude assumed by producers, who appear to be slow in accepting business at minimum quotations.

Finished Material.—There is nothing of special interest to report further than that local dealers have apparently been able to maintain previously quoted less-than-carload prices. It is also stated that while business is dull the month of November will compare favorably with the corresponding month of last year. There is probably more buying in this territory of small lots of sheets, steel bars and small structural shapes

than in other sections of the country; the late open building season here has had a considerable influence in the use of all kinds of building material. We quote steel bars, from warehouse, at 1.85c. to 1.90c. and structural shapes 1.90c. to 1.95c. The carload quotation on No. 28 black sheets is 2.15c. and on galvanized sheets 3.15c., f.o.b. cars Cincinnati.

Old Material.—Conditions are duller than for many years, and leading dealers state that there is no demand of importance from any source. The matter of price is a question that is settled between buyer and seller or vice versa when a deal comes up, and there are no stable quotations. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

	Per Gross Ton.	
Bundled sheet scrap	\$6.25 to	\$6.75
Old iron rails	10.75 to	11.75
Relaying rails, 50 lb. and up.....	19.50 to	20.00
Revolving steel rails	10.75 to	11.25
Melting steel rails	9.00 to	9.50
Old carwheels	10.00 to	10.50

	Per Net Ton.	
No. 1 railroad wrought	\$8.25 to	\$8.75
Cast borings	4.00 to	4.50
Steel turnings	4.00 to	4.50
No. 1 cast scrap	8.50 to	9.00
Burnt scrap	5.75 to	6.25
Old iron axles	15.75 to	16.25
Locomotive tires (smooth inside)	9.50 to	10.00
Pipes and flues	5.50 to	6.00
Malleable and steel scrap	6.50 to	7.00
Railroad tank and sheet scrap	4.00 to	4.50

Birmingham

BIRMINGHAM, ALA., December 1, 1913.

Pig Iron.—A slightly increased interest in purchases for 1914 delivery has developed. One seller reports an inquiry for 10,000 tons and other inquiries for a large tonnage from the pipe interests. The actual 1914 business transacted, however, is still quite small. One large company reports sales during the week of 1000 tons, of which the largest lot consisted of 500 tons, on the \$11.50 basis. The manufacturers of Clifton iron, which rules \$1 to \$1.50 over ordinary foundry, continue to sell the make of one furnace at \$12.50 to \$13, mostly in Southern territory. One lot of 500 tons for spot delivery in St. Louis territory brought \$11.50. According to the competition involved, the basis of sales now being made is from \$11 to \$11.50, the higher figure applying generally for spot shipments in the Southern territory. Some Tennessee furnaces are openly quoting \$11, and it is perhaps true that a limited amount of Tennessee and resale iron might be secured under \$11, but none of the Birmingham furnace operators appears to care for business under that price. One concern is still adhering to the \$11.50 basis. Charcoal iron is also maintaining its own, the most recent sale of several hundred tons having been on a \$25 basis. Stocks of foundry iron have further declined. The recently relighted furnace of the Republic Company will be blown out for repairs by the middle of the month. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$11.50 to \$12.00
No. 2 foundry and soft	11.00 to 11.50
No. 3 foundry	10.50 to 11.00
No. 4 foundry	10.25 to 10.75
Gray forge	10.00 to 10.50
Basic	11.00 to 11.25
Charcoal	23.50 to 24.00

Cast-Iron Pipe.—The manufacturers of soil pipe state that trade is dull and output is on half turn. The new plant of the Standard Foundry Company at Anniston, Ala., has commenced operations. The manufacturers of water and gas pipe are operating with a reduced number of pits, but prices are maintained and the general feeling is inclined to be hopeful. No more large contracts have been awarded, but the Government is expected to be heard from soon with additional orders for Panama delivery.

Coal and Coke.—Coal mines are busier than for some time and the demand for steam coal has picked up. The output of Alabama this year will approximate 18,000,000 tons. The plant of the Alabama Fuel & Iron Company, at Acton, where 18 miners recently lost their lives through a gas explosion, was not seriously injured. Coke is still weak in price, but there has been some recovery in the volume of business. We quote, per net ton, f.o.b. ovens, as follows: Furnace coke, \$2.50 to \$3; foundry, \$3.50 to \$4.

Old Material.—A fair demand obtains for all grades of scrap and dealers are freely laying in stocks. Quo-

tations, per gross ton, f.o.b. dealers' yards, have not been changed and are as follows:

Old iron axles (light)	\$15.00 to \$15.50
Old steel axles (light)	15.00 to 15.50
Old iron rails	12.50 to 13.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.00 to 10.50
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	8.50 to 9.00
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.50 to 11.00
Tram carwheels	10.50 to 11.00
Standard carwheels	12.00 to 12.50
Light cast and stove plate	8.50 to 9.00

British Sheet Trade Improved

Galvanized Sheets in Demand for India and Argentina—More Tin Plate for America

(By Cable)

LONDON, ENGLAND, December 3, 1913.

Decided improvement is seen in galvanized sheets, with India and Argentina buying. The demand is fair for tin plates and further American business is under negotiation. There is a slightly better tone in Continental material and less anxiety to sell semi-finished steel. In other respects the position is practically as before and the markets are featureless. We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 12s. 7½d. (\$3.07), against 12s. 9d. (\$3.10) one week ago. (The following prices are per ton of 2240 lb.):

Cleveland pig-iron warrants (Tuesday), 49s. ½d. (\$11.93), against 49s. 2d. (\$11.95) one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 49s. 6d. (\$12.03).

Hematite pig iron, 61s. (\$14.84), f.o.b. Tees.

Ferromanganese, 49 4s. 9d. (\$44.95), a reduction of 12s. 6d. (\$3.05) from last week.

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 15s. (\$23.11).

Steel bars, export, f.o.b. Clyde, £6 5s. (\$30.48).

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 15s. (\$27.08).

Steel ship plates, Scotch, delivered local yards, £6 17s. 6d. (\$33.46).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 (\$43.80).

Steel rails, export, f.o.b. works port, £6 5s. (\$30.41).

(The following prices are per export ton of 1015 kilos, equivalent to 2237.660 lb.):

German sheet bars, f.o.b. Antwerp, 82s. 6d. (\$20.07), against 77s. (\$18.73) one week ago.

German 2-in. billets, f.o.b. Antwerp, 80s. (\$19.46).

German basic steel bars, f.o.b. Antwerp, £4 11s to £4 12s. (\$22.13 to \$22.37).

German joists, f.o.b. Antwerp, £5 5s. to £5 8s. (\$25.55 to \$26.28).

Demand Improving in Germany

Buying of Bars and Plates for First Quarter—Structural Shapes Still Neglected

BERLIN, November 20, 1913.

While a better tendency in part is reported, this appears to be confined to narrow limits. At a general meeting of manufacturers in the Luxemburg-Lorraine region several days ago great diversity of views about the trade position was noted; it was agreed, however, that the demand had latterly improved somewhat and that prices had begun to rise a little. In the Rhine-Westphalian district the better tendency in bars reported last week has continued. Dealers and consumers are showing greater readiness to buy both bars and plates and they have now placed orders for about all their requirements for the first quarter of 1914. This has added appreciably to the amount of work in hand, and some of the mills have already sold up to their capacity in thin plates to the end of March. Another good factor for the general trade is that the Coal Syndicate on Monday voted to reduce coking coal and coke prices. Blast furnace coke was reduced 36c.; other qualities of coke, 19c. to 48c., and coking coal 24c. These prices take effect January 1.

Ore Prices Reduced—Better Buying of Pig Iron

Reductions in prices of ore are reported. The Siegerland ore producers voted a cut of 5 marks (\$1.19)

per 10-ton carload on unroasted sparry iron ore and 5 to 8 marks (\$1.19 to \$1.90) on brown iron ore. Roasted ores were left unchanged. The reductions mentioned are for the first half of 1914. The new price for sparry ore is 126 marks (\$29.99) for 10-ton carloads. The calls for delivery of roasted ores in the Siegerland district are quite brisk, but buying of foreign ores for next year is still quiet.

Pig iron is now being bought for next year somewhat more actively. Foreign sales are wholly influenced by the English market, where very low prices rule. According to a later report, the sales of German pig iron in Scotland were not so important as asserted by the press last week; it is now claimed that only small amounts were sold there as an experiment. But the prices obtained, it is added, were hardly high enough to encourage its repetition. Business in scrap continues extremely quiet, and prices are further giving way.

Conditions in semi-finished steel are about at a standstill. Consumers are calling for deliveries on order at a satisfactory pace, and are doing some supplementary buying. Export prices have fallen further. Billets are now 76 to 78 marks (\$18.09 to \$18.56) and slabs 78 to 80 marks (\$18.56 to \$19.04) f.o.b. Antwerp. These prices are 2 to 3 marks (48c. to 71c.) lower than a month ago.

Steel Bars Advanced—Structural Shapes Weak

Bars, as already indicated, are doing somewhat better. Prices are now quoted at 93 to 95 marks (\$22.13 to \$22.61), with a few mills demanding as much as 96 to 97 marks (\$22.85 to \$23.09). Export prices, however, are still remarkably low; the average is 90 marks (\$21.42) on board ship.

The mills are complaining of an increasing scarcity of orders for structural shapes. The shipments of the Union are only about 60 per cent. of the total allotments in these goods. The export price is 111 marks (\$26.42) on ship at Antwerp, with a rebate of 3 marks (71c.) for southern England. A rebate is also given for other countries.

In heavy plates buying has latterly been more active, induced by the extremely low level already reached and by the growing requirements of the shipyards. Prices have been lifted a little; 98 to 100 marks (\$23.32 to \$23.80) are now mentioned as the lowest prices for ordinary plates, and 102 to 103 marks (\$24.28 to \$24.51) for ship plates. In export business prices range between 100 and 102 marks (\$23.80 to \$24.28). Thin and medium thicknesses have also been bought more actively at prices ranging between 115 and 117.50 marks (\$27.37 to \$27.96); with considerable business at even lower prices. Foreign markets have taken considerable quantities at 104 to 105 marks (\$24.75 to \$24.99) f.o.b. seaport.

Steel rails continue in a strong position. It is expected that the Prussian railroads will take larger quantities for next year's delivery; but it is doubted whether the authorities will continue to pay 118 marks (\$28.08) for rails and 109 marks (\$25.94) for ties. South American countries are taking much smaller quantities, but various countries in northern Europe are expected to send in orders soon. Rails for mines are weaker, but grooved rails are still doing well.

Good Financial Showing by Large Makers

The annual reports of Krupp and the Gutehoffnungshütte have been issued this week. Krupp's report is remarkably good, showing net earnings, including amount brought over from last year, of a little more than \$10,000,000, as against about \$8,000,000 for last year. The dividend is 14 per cent., against 12 per cent. a year ago. This good result was largely due to the fact that the new establishment at Rheinhausen, the so-called Friedrich-Alfred-Hütte, came into full production of nearly 1,000,000 tons of steel during the year, and it is also in part attributed to the very heavy orders for military supplies for various countries. The net earnings of the Gutehoffnungshütte reached \$2,350,000, including the amount brought over from last year, as compared with \$2,000,000 for the previous year. The dividend remains unchanged at 20 per cent. The company will erect another blast furnace.

From Belgium the news this week is mixed. The export prices of bars have been raised 1s. to 90 to 92s. (\$21.90 to \$22.39) for steel and 94 to 96s. (\$22.88 to \$23.35) for iron bars. On the other hand, the home prices of puddling iron were reduced 1.50 francs (29c.) to 64 to 64.50 francs (\$12.35 to \$12.64), and foundry iron 1 franc (19c.) to 74 to 75 francs (\$14.28 to \$14.48).

and Thomas iron to 67.50 to 68 francs (\$13.02 to \$13.12).

The Austrian trade reports a sharp shrinkage in sales for October.

German Iron Prices

The Cologne Gazette of November 20 gives these quotations:

	Marks
10 to 11 per cent. spiegeleisen, Siegen.....	.69 (\$16.42)
High grade puddling, Siegen.....	.66 (\$15.71)
Steel-making iron, Siegen.....	
Hematite, Rhine-Westphalia.....	.79.50 (\$18.92)
Foundry No. 1, Rhine-Westphalia.....	.75.50 (\$17.97)
Foundry No. 3, Rhine-Westphalia.....	.70.50 (\$16.78)
Ingots.....	.82.50 (\$19.63)
Blooms.....	.87.50 (\$20.82)
Billets.....	.95 (\$22.61)
Slabs.....	.97.50 (\$23.20)
(Add 5 marks (\$1.19) to the above for open-hearth)	
Billets for export.....	.76 to .78 (\$18.09 to \$18.56)
Slabs for export.....	.78 to .80 (\$18.56 to \$19.04)
Bars, steel.....	.93 to .97 (\$22.13 to \$23.09)
Bars, iron.....	.135 to .138 (\$32.13 to \$32.84)
Bars, iron, for export.....	.127.50 to .130 (\$30.44 to \$30.94)
Bars, steel, for export.....	.90 (\$21.42)
Band iron.....	.116 to .118 (\$27.61 to \$28.08)
Beams, at Diedenhofen.....	.110 (\$26.18)
Beams for export, f.o.b. seaport.....	.111 (\$26.42)
(with 3 marks (71c.) rebate)	
Heavy plates.....	.98 to 1.00 (\$23.32 to \$23.80)
Ship plates.....	.100 to .102 (\$23.80 to \$24.28)
Plates, medium and thin.....	.115 to .117.50 (\$27.37 to \$27.96)
Plates, medium and thin, for export.....	
1.04 to 1.05 (\$24.75 to \$24.99)	
Wire rods.....	.117.70 (\$28.01)
Steel rails, heavy, export, f.o.b. seaport.....	
(big orders)	
Grooved rails.....	.140 to .145 (\$33.32 to \$34.51)
Rails for mines.....	.115 to .117.50 (\$27.37 to \$27.96)

St. Louis

ST. LOUIS, Mo., December 1, 1913.

Confidence is expressed in a near change for the better and meanwhile the cost of production and lack of sufficiently attractive business fail to develop price competition.

Pig Iron.—Aside from a single transaction there was no business for more than carloads, etc. There is practically no future business under consideration at present, while at the same time furnace representatives have refused to quote below \$11 for No. 2 foundry Southern, Birmingham basis, for any period of 1914, and the best evidence of their firmness is the fact that an inquiry for 2500 tons which has been in the market for nearly a month and on which the inquirer has expressed a willingness to buy at \$10.50 is still unfilled. The only real transaction of the week was one of 15,000 tons of Northern basic, bought by a local steel foundry interest, whose inquiry went out as for 6000 tons and was followed by the purchase of the larger quantity at figures offered, but withheld from publication. Furnace representatives declare that there are a number of attractive large inquiries being figured on in nearby territory in a confidential way and assert a belief that a turn in the market will be shown soon. There are others, however, who take the pessimistic view. No. 2 Chicago and No. 2 Northern show no change in quotations. Some late inquiries appearing to-day were for several lots of 200 to 300 tons each, first quarter delivery.

Coke.—Business in coke has been very quiet and the transactions have all been of the extremely small lot type, which have, of necessity, commanded slightly better prices than the market quotations on attractive lots. There are no contracts pending, nor are any expected to come out. By-product coke is selling on a parity with Connellsville, the delivered price in St. Louis being about \$4.30 to \$4.55, according to delivery.

Finished Iron and Steel.—In structural material, the shops continue to take material right along, but are not anxious buyers, as they know they are able to get deliveries almost at will. New business will probably run 40 to 50 per cent. of shipments. Light rails have been moving slowly, chiefly to the coal interests which have about completed filling their expected requirements for the busy season. Track fastenings are rather quiet. Bars are in better demand than other classes of material. Prices are about on a basis of 1.30c. to 1.35c., Pittsburgh, for structural, but if any attractive business were to appear it would be handled on the basis of surrounding conditions rather than on a prevailing quotation.

Old Material.—In the scrap market there have been no offerings of moment. At the same time the dealers have shown no disposition to take any material even at extremely attractive figures to lay down against future

profit making. There has been some better feeling in cast scrap, for which the demand has shown more life than any other class of old material. This is due to needs of some of the steel foundries. Rolling mills, however, are not only not taking any material, but are in many instances shutting down. We quote dealers' prices, f.o.b. St. Louis, as follows:

	Per Gross Ton.
Old iron rails.....	\$10.25 to \$10.75
Old steel rails, rerolling.....	10.75 to 11.25
Old steel rails, less than 3 feet.....	9.25 to 9.75
Relaying rails, standard section, subject to inspection.....	23.00 to 24.00
Old carwheels.....	10.25 to 10.75
Heavy melting steel scrap.....	8.75 to 9.25
Shoveling steel.....	7.75 to 8.25
Frogs, switches and guards cut apart.....	8.25 to 8.75
	Per Net Ton.
Iron angle bars.....	\$8.75 to \$9.25
Steel angle bars.....	7.25 to 7.75
Iron car axles.....	15.75 to 16.25
Steel car axles.....	10.25 to 10.75
Wrought arch bars and transoms.....	10.25 to 10.75
No. 1 railroad wrought.....	7.75 to 8.25
No. 2 railroad wrought.....	7.25 to 7.75
Railroad springs.....	7.00 to 7.50
Steel couplers and knuckles.....	7.00 to 7.50
Locomotive tires, smooth.....	8.75 to 9.25
No. 1 dealers' forge.....	6.25 to 6.75
Mixed borings.....	2.25 to 2.75
No. 1 busheling.....	6.25 to 6.75
No. 1 boilers, cut to sheets and rings.....	3.25 to 3.75
No. 1 cast scrap.....	9.00 to 9.50
Stove plate and light cast scrap.....	6.25 to 6.75
Railroad malleable.....	6.75 to 7.25
Agricultural malleable.....	6.25 to 6.75
Pipes and flues.....	4.25 to 4.75
Railroad sheet and tank scrap.....	3.25 to 3.75
Railroad grate bars.....	5.75 to 6.25
Machine shop turnings.....	3.25 to 3.75
Bundled sheet scrap.....	3.75 to 4.25

San Francisco

SAN FRANCISCO, CAL., November 25, 1913.

Business in practically all steel products is extremely quiet. In a few lines a fair consuming demand is reported, but in general there has been considerable curtailment in the past month, and no improvement is expected in December. Rumors have been circulated of still lower prices on both domestic and foreign material, but except for another decline in sheets there is no confirmation at present. Competitive conditions in the local jobbing trade, however, have brought about an unsatisfactory condition, resale prices in practically all lines being weak and irregular. Merchants and large consumers continue to buy from hand to mouth, in many cases waiting until material is urgently needed before placing orders. This policy is due largely to the expectation of lower freight rates.

Bars.—Orders from merchants and manufacturers for soft steel bars are extremely small, being limited to the most urgent requirements. Stocks are exceptionally light, but, with a heavy tonnage of foreign material to arrive in the first quarter, there is no desire to increase the supply. Resale prices have declined, being quoted at 2.10c. for steel and 2c. for iron. The tonnage of reinforcing material is rather light, with prices on about the former basis.

Structural Material.—The Hobart building contract is reported let to Milliken Bros. Aside from this only a few unimportant contracts have been let, though several fairly large jobs are expected to come out within the next week, including the Exposition tower. No award is announced on the Los Angeles wharf job, on which the McClintic Marshall Construction Company was low bidder, and it is possible that new figures will be taken. The proposal to erect a municipal opera house here has apparently been abandoned. It is reported that a 12-story building will be erected at Nineteenth street and Broadway, Oakland, by the Chicago Assets Realization Company. Bonds were voted recently for a bridge over the Columbia River at Vancouver, Wash. Prices on plain material are still unsettled, and a very low figure on foreign shapes has been reported.

Rails.—There has been some inquiry, and a fair tonnage is expected in the near future. Prospects for next year are rather encouraging, especially in the north, where numerous logging roads are projected, in addition to several extensions for one or two large systems.

Plates.—While purchases are held down closely to current requirements, and merchants are buying practically nothing, the movement to manufacturers is fairly well maintained for this season. Tank and pipe orders are still coming out in good shape, and with fair

assurance of large contracts in the spring, renewed activity is expected early in the year. Buyers are extremely cautious in regard to foreign material. The Lacy Mfg. Company is low bidder on a 60-mile riveted pipe line for Riverside, Cal., at \$193,587. The Standard Oil Company is preparing for further enlargement of its storage and refining plants at Richmond and Los Angeles harbor.

Sheets.—Distributive trade is quiet and, with a further decline in prices, merchants are keeping their stocks at the smallest possible limits. The tonnage taken by mill agents is light, and consists almost entirely of small orders for immediate delivery. Resale prices continue low and unsettled.

Standard Pipe.—No large inquiries are coming out, and while orders for prompt shipment are fairly numerous the aggregate tonnage is far below normal. A fair jobbing business is reported in some quarters, but on the whole merchants' sales are on the same scale as their purchases, and there seems to be no definite level of prices.

Cast-Iron Pipe.—Recent business has been limited to a few small orders from private concerns. The Riverside contract is still undecided, and the only new inquiry worth mentioning is for 450 tons for the city of Los Angeles, bids to be taken December 5. Progress in financing numerous municipal projects, however, gives considerable encouragement for the near future.

Pig Iron.—Several large shipments of English iron have arrived recently, and the tonnage on hand is comparatively heavy, with further large arrivals due shortly. Foundries are not well engaged, and are buying practically nothing. No definite quotations can be given on foreign iron, though some offers have been reported at about \$1 under Southern, and some holders would probably make concessions on round lots if a buyer could be found. For No. 1 Southern foundry iron about \$22.25 to \$23.50 is asked, but none can be sold at these figures.

Coke.—With about six cargoes of German Syndicate coke being discharged, and more to arrive, this market is more than amply supplied. Most melters made purchases prior to arrival covering nearby requirements, and are now out of the market. Prices are quoted as before at \$13 to \$14 per net ton, at yard, and \$11 to \$11.50 per gross ton, to arrive.

Old Material.—Somewhat more inquiry is reported for cast-iron scrap than for some time, and considerable business is expected, stock in dealers' hands being held at \$18 per net ton. Re-rolling rails are also in better demand, at \$15 per net ton. The last fortnight has brought out no important business in steel melting scrap, and there is some divergence of views as to prices. Consumers appear confident of their ability to fill their requirements at prices below \$10, while the principal dealers are holding out for \$12 to \$13 per gross ton. Wrought scrap is quoted as before at \$13 to \$15 per net ton. Some large sales of relaying rails are reported at about \$35.

The San Francisco Iron & Metal Company is increasing its facilities at Los Angeles, where it has secured an eight-acre site for a scrap yard on the Salt Lake Railroad.

Buffalo

BUFFALO, N. Y., December 2, 1913.

Pig Iron.—The week has developed a better demand than for some time stimulated by the lower prices obtainable. Orders booked have run up to between 15,000 and 18,000 tons. This total is comprised largely of foundry grades but includes some basic and considerable malleable. One railroad supply foundry has bought a round tonnage of malleable for December and first quarter delivery. The general situation in the foundry trade for the district, however, shows a steady lessening of activity, as regards new casting business placed, although the output of melters on old contracts is still of large volume. This heavy consumption on their part is indicated by the fact that one large producing interest here yesterday broke all previous records for one day's shipment of pig iron when it forwarded from its furnaces 70 carloads, the majority being 50-ton cars. Its daily shipments for the other days of the past week were also large. Prices have eased off further, and the range has narrowed to approximately \$13 to \$13.50 for the lower and the higher

grades. It is impossible to represent the market with a set schedule at the present time. We approximate it as nearly as possible for the remainder of year and first quarter delivery, f.o.b. furnace, as follows:

No. 1 foundry	\$13.50
No. 2 X foundry	13.25
No. 2 plain	13.00
No. 3 foundry	13.00
Gray forge	13.00
Malleable	\$13.00 to 13.50
Basic	13.75 to 14.25
Charcoal	15.50 to 16.50
Charcoal, special brands and analysis	17.00 to 19.50

Finished Iron and Steel.—Users in nearly all lines are holding off, and the total of buying has been small, representing only actual necessities for immediate use. Agencies report that it is harder to secure orders for even small tonnages now than for several weeks. In the opinion of many sellers, however, price levels have about reached bottom and they express the belief that business will show an improvement soon after the first of the coming year. There is a better and stronger feeling on semi-finished materials than there was a week ago. Some tin plate business has been negotiated with can manufacturers. In fabricated structural lines the situation is quiet. A good many building projects which have been talked of have been deferred until later in the winter or spring. Bids will be opened December 4 for 1200 tons of steel for the south side high school, Buffalo, and bids will be taken early in the new year for replacement of two spans in the Chicago street viaduct here, requiring about 300 tons. Architects Leon H. Lempert & Sons, Rochester, are ready for bids on a theater building at Hartford, Conn., taking a moderate tonnage. Bids will soon be received by Duncan W. Peck, State superintendent of public works, Albany, for 18,550 sq. ft. of steel sheet piling for a siding on the New York Central at Hoffmans, N. Y.

Old Material.—Market conditions remain the same as last week, with the demand at very low ebb in all lines, except borings and turnings which are still moving freely. There is no disposition among dealers to sell at concessions and consumers are not inclined to purchase even at shaded prices, except for small tonnages. Prices remain unchanged and nominal as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$9.75 to \$10.50
Boiler plate, sheared	11.50 to 12.00
Bundled sheet scrap	6.00 to 6.50
No. 1 busheling scrap	9.00 to 9.50
No. 2 busheling scrap	6.00 to 6.50
Low phosphorus steel scrap	16.50 to 17.00
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.00 to 12.50
No. 1 railroad and machinery cast scrap	12.00 to 12.50
Steel axles	17.00 to 17.50
Iron axles	22.50 to 23.00
Car wheels	11.75 to 12.25
Railroad malleable	11.00 to 11.50
Locomotive grate bars	9.50 to 10.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	5.00 to 5.50
Heavy steel axle turnings	8.00 to 8.75
Clean cast borings	5.50 to 6.00

Boston

BOSTON, MASS., December 1, 1913.

Old Material.—The market is so dull that dealers cannot talk prices intelligently, as they express it. The lower figures quoted last week might be shaded a little—probably they have been in some transactions. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	\$7.75 to \$8.00
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.25 to 13.75
Old iron axles	21.25 to 21.75
Mixed shafting	12.25 to 12.50
No. 1 wrought and soft steel	9.00 to 9.25
Skeleton (bundled)	6.00 to 6.50
Wrought-iron pipe	6.50 to 7.00
Cotton ties (bundled)	7.00 to 7.25
No. 2 light	3.75 to 4.25
Wrought turnings	4.50 to 5.00
Cast borings	4.50 to 5.00
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	6.25 to 6.50
Cast-iron carwheels	11.00 to 11.25

New York

NEW YORK, December 3, 1913.

Pig Iron.—More business has come up in the past week and some of it has brought out low prices, as compared with what has been considered the market. Prices show a considerable range, depending on the amount of iron involved and on the number of sellers to whom inquiries were sent. One New York State buyer in territory tributary to this city has been in the market for 1000 tons of malleable pig iron, delivery extending one or two months into the new year. This purchase has not yet been made. A New Jersey manufacturer of machinery has inquired for 800 to 1000 tons and a manufacturer of machine tools, also in New Jersey, has bought about 1000 tons at \$15 delivered for No. 2 X. Buffalo has been the center of some activity, a number of Canadian inquiries coming to furnaces in that district. A coupler company has been in the market for 3000 to 5000 tons of malleable Bessemer and a part or all of the desired amount is reported to have been bought at a lower price than has been named in connection with any other recent Buffalo transaction. The same buyer is expected to purchase basic iron. Several large interests are coming down to the end of the year without having bought for the first quarter of 1914, though iron already under contract may carry them over into the first two or three weeks of January. The variations in asking prices of eastern Pennsylvania furnaces are particularly marked. As low as \$14 at furnace, which would be \$14.70 at Jersey City, has been reported, while at the other extreme is the quotation of \$15 at furnace for No. 2 X, which would represent \$15.70 at tidewater. Very little has been done in Southern iron in the East and little from that section seems to be pressed for sale, which is in contrast with what some Northern furnaces are doing. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, \$15.25 to \$15.50; No. 2 X, \$14.75 to \$15.25; No. 2 plain, \$14.50 to \$15. Southern iron is quoted at \$15.50 to \$15.75 for No. 1 foundry and \$15 to \$15.25 for No. 2.

Finished Iron and Steel.—Orders in railroad car buying have looked up a little. The Grand Trunk has come into the market for 500 flat cars and 500 stock cars; the Alabama, Tennessee & Northern for 300 box, 125 gondolas and 75 flat cars; the New England Coal & Coke Company for 200 hopper cars; the Chicago Elevated Railways for 120 electric cars; the Chicago Great Western for 1500 underframes, and the 2000 cars of the Pittsburgh, Wabash Terminal Company are expected to be settled before the week is up. The Buffalo, Rochester & Pittsburgh has bought 1600 underframes from the Pressed Steel Car Company and the Lehigh Valley has bought 500 underframes from the Standard Steel Car Company and 500 underframes from the American Car & Foundry Company. The Carolina, Clinchfield & Ohio has placed 300 stock cars with the Pressed Steel Car Company. It is understood that the Toledo, St. Louis & Western has purchased 1000 box cars from the Haskell & Barker Car Company. In structural steel the award is learned of 1500 tons for an apartment house, 150th street and Broadway, to the Hay Foundry & Iron Works, and 900 tons for two schoolhouses in Brooklyn, to the Warren Steel Company. The exact status of the tonnage of fabricated material involved in the subway sections, on which bids have been taken since November 6 for a total of perhaps 90,000 tons, is not definite at this writing, but the indications of contracts yet to be signed are that the American Bridge Company will supply most, if not all, of the material. A building on East Sixty-third street, for the Lenox Hill Realty Company, 550 tons, is being figured and mention has been made of an ice plant, 184th street, requiring 500 tons of steel and 100 tons of cast iron columns. Post & McCord has 400 tons for the Loose Wiles garage, Brooklyn. We quote mill shipments of bars at 1.30c., Pittsburgh, or 1.46c., New York, although 1.25c. is more frequently heard, and steel plates and plain structural material at 1.25c. to 1.30c., Pittsburgh, though a really large offering would probably bring 1.20c., Pittsburgh. We quote for refined iron 1.30c. to 1.40c., New York. Iron and steel bars from store are 1.90c. to 1.95c. and shapes and plates 1.95c. to 2c.

Cast-Iron Pipe.—The only public letting of importance now up for bids is that of Hartford, Conn., 650 tons, 6 to 16 in., which opens December 11. The general demand is extremely light, which is customary at this season. The pipe foundries have little work on hand, and competition for sizable business is exceedingly sharp. On carload lots, however, \$23 to \$24 per net ton, tidewater, continues to be quoted for 6 in.

Ferroalloys.—The English producers have reduced their quotation on 80 per cent. ferromanganese \$3 per ton, making the price \$47, Baltimore, instead of \$50. The reduction is not surprising since new business has been extremely scarce. Specifications on contracts for both ferromanganese and ferrosilicon are holding their own with the exception of a few requests for deferred shipments because of impending inventories. For 50 per cent. ferrosilicon we continue to quote, \$75, Pittsburgh, for carloads; \$74 for 100 tons, and \$73 for 600 tons or over.

Old Material.—The situation grows worse. Practically no demand is coming to dealers from consumers, while it is found difficult to fill the remaining portions of contracts entered some time ago at higher prices than those now prevailing. Stocks in dealers' hands in this vicinity are not large but there is some pressure to sell, owing to financial conditions. The outlook is for still lower prices. Dealers' quotations are as follows, per gross ton, New York:

Old girder and T rails for melting	\$7.50 to \$8.00
Heavy melting steel scrap	7.50 to 8.00
Relaying rails	20.50 to 21.00
Rerolling rails	10.00 to 10.50
Iron car axles	19.00 to 20.00
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	10.25 to 10.75
Wrought-iron track scrap	9.25 to 9.75
No. 1 yard wrought, long	8.75 to 9.25
No. 1 yard wrought, short	7.75 to 8.25
Light iron	2.50 to 3.00
Cast borings	4.25 to 4.75
Wrought turnings	4.00 to 4.50
Wrought pipe	6.50 to 7.00
Carwheels	10.50 to 11.00
No. 1 heavy cast, broken up	10.50 to 11.00
Stove plate	7.50 to 8.00
Locomotive grate bars	6.75 to 7.25
Malleable cast	7.00 to 7.50

Metal Market

NEW YORK, December 3, 1913.

The Week's Prices

Cents Per Pound for Early Delivery.									
Copper, New York		Tin, New York		Lead, New York		Spelter, New York		St. Louis	
Nov.	Lake.	Nov.	Lake.	Nov.	Lake.	Nov.	Lake.	Nov.	Lake.
28.....	15.25	14.75	39.50	4.25	4.10	5.25	5.10	5.25	5.10
29.....	15.25	14.75	.....	4.25	4.10	5.25	5.10	.....	.....
Dec.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1.....	15.12½	14.62½	39.05	4.25	4.10	5.20	5.05	.....	.....
2.....	15.00	14.62½	38.65	4.10	3.95	5.15	5.00	.....	.....
3.....	15.00	14.62½	38.50	4.10	3.95	5.15	5.00	.....	.....

Copper is lower, with no demand. Unfavorable statistics and light business have made tin lower. Consumers are not taking lead and prices have declined. Spelter is off a few points and continues weak. Antimony shares the general trend of the metals.

New York

Copper.—In copper there is practically no market and it is difficult to obtain actual prices. It is probable that holders would be glad to dispose of electrolytic at 14.50c., cash, and there has been some talk of 14.37½c., cash. The European market is unsettled and on about the same basis as the domestic. Lake is absolutely nominal at about 15c., with a probability that when business starts the price will be near 15c., cash. The statistics for November are expected to show fair production, a decrease in consumption and a consequent substantial increase in stocks. So far as the needs of consumers are concerned, it can only be repeated that stocks carried over, added to the small quantities already purchased, will carry them along for a time. December 1 the base prices of brass and copper sheets, rods, tubes and wire were reduced, the trade in these products having slowed up materially. The nominal price of Lake is 15c. and of electrolytic 14.62½c., with a strong probability that the latter price could be shaded from ½c. to ⅓c. The quotations in London to-day were £65 12s. 6d. for spot and £64 7s. 6d. for futures. Exports of month are 2022 tons. The total exports of November were 29,508 tons.

Copper Averages.—The Waterbury average for November was 16.25c. The average New York price for Lake, based on daily quotations in *The Iron Age*, was 16.16c., and for electrolytic 15.45c.

Pig Tin.—The market has been quiet, with quick deliveries specified in what little business has been done. There has been considerable looking around for futures and buying of forward positions is likely to come at almost any time, judging from the indications. The Banca sale which took place at Amsterdam on November 27 realized an average price of 109¼ florins, equal to 40c., c.i.f. New York, which was considered only fair compared with the 116¼ florins, or 42.30c., c.i.f. New

York, averaged at the previous sale. The statistics for November were considered unfavorable and precipitated still further declines. The November deliveries into consumption were light, amounting to but 2800 tons, a figure which was below most estimates. The total for 11 months, 40,800 tons, was 4650 tons less than that of the same period in 1912. The total visible supply November 30, 1913, was 14,470 tons, or 2122 tons above that of November 30 a year ago. On top of this showing the price dropped yesterday to 38.65c. and to-day it is quoted at 38.50c. The quotations in London to-day were £176 for spot and £177 for futures. December arrivals amount to 550 tons and there is afloat 2135 tons.

Lead.—Late on November 26, the American Smelting & Refining Company reduced its price \$2 a ton, or from 4.35c. to 4.25c., New York. Yesterday it announced a further reduction of \$3 a ton, bringing the quotations down to 4.10c., New York, and 3.95c., St. Louis, which are generally admitted to be very low. The principal reason for the declines is given as the light business. The curtailment of the supply of Mexican ore would seem to be a bull influence, but it is offset by the plentiful supply of lead and other conditions, not only in this country, but abroad. The London market has been subject to declines also, the quotation there to-day being £17 5s. Press dispatches state that all smelting properties in Mexico owned by the American Smelting & Refining Company are to be closed down. This includes the Monterey smelter, employing more than 2000 men.

Spelter.—To the heavy falling off in consumption is attributed the weak state of this metal, quotations for which are now 5.15c. to 5.20c., New York, and 5c. to 5.05c., St. Louis. Neither brass mills nor galvanizers are taking anywhere near normal quantities.

Antimony.—Except that this metal shares the general weak trend of the market, there is nothing to say regarding antimony. Quotations are 7.10c. to 7.20c. for Hallett's, 7.40c. to 7.50c. for Cookson's and 6.25c. to 6.50c. for Chinese and Hungarian grades.

Old Metals.—Business is too small to establish actual prices. Dealers selling quotations are nominally as follows:

	Cents per lb.
Copper, heavy and crucible.....	14.00 to 14.25
Copper, heavy and wire.....	13.50 to 13.75
Copper, light and bottoms.....	12.25 to 12.50
Brass, heavy.....	8.50 to 8.75
Brass, light.....	7.50 to 7.75
Heavy machine composition.....	12.25 to 12.50
Clean brass turnings.....	8.50 to 8.75
Composition turnings.....	10.75 to 11.00
Lead, heavy.....	3.90
Lead, tea.....	3.65
Zinc, scrap.....	4.10

Chicago

DECEMBER 1.—The copper market is much interested in the probability of a general shutdown of the Michigan mines, following the closing of most of the Lake smelters. Another slump in prices occurred during the week, accompanied by rumors of even greater irregularities. Spelter quotations are also weaker. We quote as follows: Casting copper, 15c.; Lake copper, 15.25c., for prompt shipment; small lots, 1/4c. to 1/8c. higher; pig tin, carloads, 40c.; small lots, 42c.; lead, desilverized, 4.20c. to 4.30c., and corroding, 4.45c. to 4.60c. for 50-ton lots; in carloads, 2 1/2c. per 100 lb. higher; spelter, 5.10c. to 5.15c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, \$7.50, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. sacks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 12.25c.; copper bottoms, 10.75c.; copper clips, 11.75c.; red brass, 11c.; yellow brass, 8c.; lead pipe, 3.60c.; zinc, 3.60c.; pewter, No. 1, 23c.; tin foil, 29c.; block tin pipe, 32c.

St. Louis

DECEMBER 1.—The metal market has been quiet and with few transactions prices have continued to sink on the Missouri products. Lead is nominally 4.12 1/2c.; spelter, 5c. to 5.05c.; tin, 39.85c. to 40.10c.; Lake copper, 15.35c. to 15.85c.; electrolytic copper 15.25c. to 15.75c.; Cookson's antimony, 7.85c. to 8.10c. In the Joplin ore market business was done at sharply lower figures. The basis range for 60 per cent. zinc blende was \$37 to \$40, with the top settlement for the choicest reaching about \$43 per ton. On calamine the basis range for 40 per cent. was \$19 to \$21, while the top settlement ran to about \$27. Lead ore was dull at \$52 for 80 per cent. On miscellaneous scrap metals we quote as follows: Light brass, 5.50c.; heavy yellow brass, 8.50c.; heavy red brass and light copper, 10.50c.; heavy copper and copper wire, 11.50c.; zinc, 2.75c.; lead, 3c.; pewter, 24c.; tin foil, 30c.; tea lead, 2.75c.

Iron and Industrial Stocks

NEW YORK, December 3, 1913.

Profound dullness has continued on the Stock Exchange. The security market is awaiting developments precisely like the iron and steel trade. The widest fluctuation occurred in the American Can stocks, which declined sharply on the announcement of the Government suit for the dissolution of the company. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chalm., com.....	8	Pressed Steel, pref..	94 - 95
Am. Can, com.....	24 3/4 - 29 3/4	Railway Spring, com.....	23
Am. Can, pref.....	85 1/4 - 92	Republic, com.....	18 3/4 - 19 1/4
Am. Car & Fdy., com.	42 3/4 - 43 1/2	Republic, pref.....	79 1/2
Am. Loco., com.....	29 1/2 - 30 1/2	Rumely, com.....	14
Am. Loco., pref.....	97 1/2	Rumely, pref.....	36
Beth. Steel, com.....	29 1/4 - 30	Sloss, com.....	26 - 26 1/2
Beth. Steel, pref.....	67 3/4 - 69	U. S. Steel, com.....	54 1/4 - 56 1/4
Colorado Fuel.....	27 1/4 - 27 1/2	U. S. Steel, pref.....	104 1/2 - 105
Deere & Co., pref.....	94 1/4 - 94 3/4	Westinghouse Elec..	63 1/2 - 64 1/4
General Electric.....	137 1/2 - 138 1/2	Am. Ship, com.....	29 1/2 - 30
Gr. N. Ore Cert.....	31 1/2 - 32	Am. Ship, pref.....	82 - 82 1/2
Int. Harv., com.....	100 1/2 - 101 1/2	Chic. Pneu. Tool.....	50 - 50 1/2
Int. Harv. Corp.....	100 - 101 1/4	Cambria Steel.....	46 1/4 - 47 1/4
Int. Harv., Corp., pref.....	113 1/2	Lake Sup. Corp.....	22 - 22 1/2
Int. Pump, com.....	4 3/4 - 5 1/4	Pa. Steel, pref.....	64
Int. Pump, pref.....	16 - 17	Crucible Steel, com..	14 1/4 - 14 3/4
Nat. En. & St., com.....	10 1/4	Crucible Steel, pref..	89 - 89 1/4
Pressed Steel, com..	24 1/2 - 25 1/4	La Belle Iron, pref.....	116 1/4

Dividends Declared

The Crucible Steel Company of America, regular quarterly, 1 1/4 per cent. on the preferred stock, payable December 24.

The Pettibone-Mulliken Company, regular quarterly, 1 1/4 per cent. on the first preferred and 1 1/4 per cent. on the second preferred stocks, payable January 2.

A New Mine on the North Cuyuna Range

The Jones & Laughlin Steel Company is reported to be interested in a recent deal in iron lands on the North Cuyuna range. Thomas Feigh, of Duluth, owns the fee to a group of four forties forming a square block adjoining the Pennington mine on the west and southwest. He leased this land to the C. M. Hill Lumber Company at 35c. per ton royalty. After drilling and opening a good body of ore, this company sold the lease for \$250,000 to the Northern Pacific, which in turn has given an option to the Jones & Laughlin interests. It is not stated whether the royalty remains the same nor what the minimum tonnage is to be. Check drillings are to begin at once. Drillings have pretty well bottomed the ore, it is said, though cross-sections show possibilities of downward extension in a few lenses. The total tonnage calculated for the holes is 3,250,000. The stripping of 3,125,000 cu. yd. of drift and of 600,000 cu. yd. of rock will be necessary to uncover this. The average depth of the overburden is perhaps 80 ft. It is calculated that 100 ft. of the deposit after stripping can be steam shoveled, equivalent to a tonnage of 1,750,000, the remainder requiring milling or underground mining.

General Electric Strike Settled.—The strike of the 14,000 employees of the General Electric Company at Schenectady, N. Y., was settled November 29 at a conference of representatives of the company and the unions and Mayor Lunn. By the terms of the agreement all employees returned to work on either full or part time on Monday, December 1. In the cases of the two union officers whose lay-off caused the walk-out, arrangements were made for their reinstatement, but one of them goes to a different department.

F. N. Speller, National Tube Company, Pittsburgh, presented that company's moving pictures of pipe manufacture before the American Society of Refrigerating Engineers at the Engineering Societies Building, New York, Monday evening, December 1. A part of his address was devoted to the question of relative corrosion of wrought iron and steel pipe, with accompanying illustrations. The same films will be shown at the West Twenty-third street Y. M. C. A. Auditorium, New York, Thursday evening, December 4. Bradley Stoughton will conduct the meeting and Dr. William Campbell, Columbia University, will explain the pictures.

Pittsburgh and Valleys Business Notes

The Engineers' Society of Western Pennsylvania, prominent engineers and iron and steel manufacturers, numbering 250, visited the works of the Mesta Machine Company, West Homestead, Pa., Saturday afternoon, November 29, a special train carrying the visitors from the Pennsylvania station to Mesta station. The principal object was to inspect the 46-in. slabbing mill, the 44 and 76 by 60-in. twin tandem compound gear reversing engine, and the 44 x 48-in. three-cylinder reversing engine which the Mesta Machine Company has designed and built for the Gary works of the United States Steel Corporation. Both engines have the new type valve gear, the same as that on the engine furnished for the Youngstown Sheet & Tube Company, which was the first in this country equipped with such a valve gear. The mill will be used at the Gary works for rolling large steel ingots into slabs for the finishing mill. It is said to be the largest rolling mill of the kind in this country.

The Penn Bridge Company, Beaver Falls, Pa., has received a contract for a bridge to be erected in Pittston, Pa., the cost to be \$98,737.

The North works, consisting of an open-hearth steel plant and the blast furnace of the Carnegie Steel Company at Sharon, Pa., has been closed down, owing to the general business depression. Other industries at Sharon, consisting of the Sharon works of the American Sheet & Tin Plate Company and the plants of the American Steel Foundries and the Driggs-Seabury Ordnance Corporation are running at a greatly reduced rate.

The new club house for employees, erected by the Ohio Iron & Steel Company at Lowellville, Ohio, was opened on Monday evening, December 1. Addresses were made by several officials of the company.

The Smoke and Dust Abatement League of Pittsburgh held its annual meeting and election of officers last week. A resolution was passed unanimously that a committee of five be appointed to inquire into the merits of the present city ordinance on the smoke nuisance and its enforcement; to study the regulation of the smoke nuisance in other cities, and to recommend such changes in the existing ordinance and its administration as may be deemed wise. The new officers are: Arthur A. Hamerschlag, president; W. H. Stevenson, president Chamber of Commerce, first vice-president; Miss H. Marie Dermitt, second vice-president; I. W. Frank, treasurer; and J. J. O'Conner, secretary. It is also proposed to hold in Pittsburgh in the near future an exhibition of smoke-consuming devices.

The National Tube Company, Pittsburgh, has sent out new discount cards on oil-country goods for delivery in various parts of the country and as far as the Pacific coast. The price of 2-in. gas and oil line pipe has been reduced about 1c. per ft. No change was made in tubing, casing or drive pipe, the new price on 2-in. line pipe being made to conform more closely to 2-in. standard pipe.

The scheme to consolidate the La Belle Iron Works, Wheeling Steel & Iron Company, Whitaker-Glessner Company, Wheeling Corrugating Company and Portsmouth Steel Company has been dropped. It is understood that a satisfactory agreement could not be reached as to values of the respective properties. It is understood that the La Belle Iron Works has tentative plans made for material enlargements, including the building of 10 more sheet mills.

The board of directors of the Crucible Steel Company of America, Pittsburgh, has elected the following officers: Executive Committee, Herbert DuPuy, chairman, C. C. Ramsey, James H. Park, H. S. Wilkinson, H. S. A. Stewart, John A. Sutton and H. D. W. English. President, C. C. Ramsey; first vice-president, John A. Sutton; second vice-president, J. W. Dougherty; third vice-president, G. W. Sargent; fourth vice-president, H. A. Brown; treasurer, George A. Turville; secretary, Charles W. Rowlands.

By a business deal consummated this week, the Harroun Company, Indianapolis, Ind., first successful manufacturer of a kerosene carburetor for automobiles, will be absorbed by the Electric Renovator Mfg. Company, Pittsburgh, Pa., directly controlled by a group of the largest independent oil operators in America. The absorption of the Harroun

Company by these oil interests will mean a further development of its principles for all forms of internal combustion motors. The factory will remain temporarily in Indianapolis and will be operated in conjunction with the Pittsburgh factory, making it possible to push the product to its fullest possibilities at once. Ray Harroun, who has developed the kerosene carburetor from its inception to its present form, will remain with the new interests as an officer of the company. The Electric Renovator Mfg. Company will maintain an office in Indianapolis as well as its present offices in Pittsburgh.

The Roberts Gas & Gasoline Engine & Car Company, Morgantown, W. Va., has been incorporated with \$150,000 capital stock and is now receiving bids for plant buildings and for machine tools. Leopold Sigwart, Morgantown, is president; Eugene Summerville, Grafton, W. Va., vice-president; H. P. Keenan, Monongah, W. Va., secretary; J. M. Roberts, Pittsburgh, Pa., general manager, and Frank Sigwart, Pittsburgh, superintendent. Address H. P. Keenan, secretary, lock drawer 589, Morgantown, W. Va.

Pennsylvania Steel Co.'s New Bessemer Plant

The Pennsylvania Steel Company has successfully started its new Bessemer plant at Steelton, Pa., which will make a specialty of Mayari nickel-chrome steel by the duplex process. It was started on the afternoon of November 28 and comprises two 20-ton converters and an 800-ton mixer. The plant is located in an extension of the open-hearth mill with which it has direct crane connection. The whole undertaking—structural work, steel plant, crane equipment, dry house and refractories building—was completed in less than seven months. No. 2 Bessemer mill will be dismantled. The company some time ago dismantled No. 1 Bessemer mill, the first to make rail steel in the State.

A New Lake Freighter Ordered.—W. C. Richardson, Cleveland, has placed an order with the American Shipbuilding Company for a steel steamer of 9000 tons capacity for delivery in 1914, to replace the Howard M. Hanna, Jr., of the Richardson fleet, which was lost in the November storm. The new boat will be 524 ft. overall, 54 ft. beam and 30 ft. deep. It will have triple expansion engines and two Scotch boilers. It will be a duplicate of the steamer Leonard B. Miller and will be built in the Cleveland yards of the American Shipbuilding Company. Negotiations are under way for the purchase of at least two other steamers to replace boats that were lost in the storm.

The sixth annual meeting of the American Institute of Chemical Engineers will be held at the Chemists' Club, 50 East Forty-first street, New York City, December 10 to 13. An interesting programme has been prepared, consisting of papers by prominent members of the profession and excursions to various points in the vicinity, comprising industrial plants, the chemical engineering laboratories at Columbia University, etc. On Friday evening, December 12, a symposium will be held on welfare and safety provisions in chemical works, when methods at various plants will be described. This will be a joint session of the American Institute of Chemical Engineers, the American Chemical Society, the Society of Chemical Industry and the American Electrochemical Society.

The Harward Mfg. Company, 2811 Cherokee street, St. Louis, Mo., has perfected a very rapid method of manufacture for metal moldings, tubing, angles, etc., employing roller dies, and intends to specialize in this class of product. It is incorporated in Illinois. E. F. Cook is president and treasurer; F. Kirsch, vice-president; H. F. Haarstick, secretary.

It is stated that the Pennsylvania Railroad is considering the establishment of a rule that employees shall live or take their rest sufficiently near their work to enable them to report for duty at any hour, day or night, with not more than one hour of necessary traveling between their home or resting place and the point where they begin work.

Common Errors as to the Value of a Patent

In the Great Majority of Cases the Buyer Contributes Most of It—Adequate Reward for Inventions of Employees

BY STERLING H. BUNNELL

More than a million patents have been issued by the United States, and thousands more are granted every year. Very few patents ever bring a dollar to their inventors or owners. One in a thousand, perhaps, by showing some new way of filling a want already known or easily awakened, confers on its owner the possibility of great reward. Many are for useless or idle schemes for which there is no market. Most patents, however, cover new details for old devices, or minor improvements on ideas previously patented, or other ways of doing something already effectively done. While patents of this class have little value, and if sold by their owners will not usually bring the amount that the attorneys' and Patent Office fees have cost, several such patents grouped together in strong hands may, like several stones put together in a wall, afford effective protection.

Most lines of patented manufacture are protected, not by one strong but by many minor patents. In fact, there can hardly ever again be granted a patent in a field so new that the single patent will give, through its term of existence, complete protection to its owners. It is this state of affairs which has given rise to the common practice of large corporations in requiring their employees to sign contracts relinquishing, without special consideration, all rights in inventions which the employees may develop. Such contracts are always accepted by men out of a job, but often add to employees' convictions that corporations are soulless, and take away their last spark of initiative toward inventive improvement.

What a Patent Is and What Gives It Value

If the employee knew that each invention he might make would cost him one or two hundred dollars, and would take a year or two to sell for little if any more than that, he could easily see that his chance of reward by handling his own patent is very small. The misjudgment of employees in regard to patent contracts is due to a lack of understanding as to what a patent is and what it is good for.

The fact is that a patent as an article of merchandise is of limited use and doubtful value. In granting a patent, the government confers on the patentee the exclusive right to make and sell the particular device described, but does not undertake to search out and stop infringers. Consequently the patent is merely a permit for its owner to spend his own money in looking for people who may begin making devices like his, and to bring suit in one court after another to stop them. If the inventor's rights are to be maintained, capital must be brought into the situation from the beginning. Capital is just as necessary to establish strength in a patent, as to carry on the manufacture of the patented article. The man who has made an invention is in the same position as the man who has discovered a mine; his property is valueless until got into workable condition and then worked. For an invention, the concern in best position to buy and work it is one already interested in the field in which the invention lies. Such a company will be quick to recognize the value of the idea and the possibilities of profitable exploitation. For a man inventing along the line of his daily work, his own employer, therefore, is the one most likely to be able and ready to work the invention to advantage. The employer is accordingly the one of all persons who is best able to reward the inventing employee. In the great majority of cases employees making patented inventions are adequately rewarded. Unfortunately, very many such inventors, through misconception of the value of their work and the nature of the reward to be expected, are dissatisfied and carry grudges against the organizations to which they belong.

In forming an idea of the value of his patent, the inventor should note that no patent is worth anything unless the thing it permits its owner alone to make is something that other people want to buy. Again, a patent is worth-

less if there is no machine or man available to make the patented article. Neither is a patent useful if some other patent in force prevents the construction of some necessary detail of the patented article or the use of the article after it is made. These considerations are not usually in the mind of the inventor as he engages his attorney to make the formal drawings and specifications and pays his fees for the preliminary work and the final issue. It is often not until the imposing document is in the hands of the patentee that he begins to observe some of the limitations which affect the value of the rights conferred upon him.

Marketing a Patent

To get a clear idea of the commercial side of marketing a patent, suppose that the invention is a scheme for an effective dish-washing machine. Every one of the millions of housekeepers in this country would like to possess such a machine, so that the field for sale is encouragingly broad. But sales will be limited unless the machine is low in price, and will not continue unless the machine lasts long in use and gives no trouble. The machine must therefore be made at low cost and of good materials and workmanship, which requires factory manufacture in quantity. After manufacture has been provided for, much money must be spent in attractive advertising and in showing the machines to possible purchasers, before sales will amount to much. Therefore, nobody will buy the patent for manufacturing purposes unless he has capital enough to manufacture, carry in stock, advertise and sell the machines in quantity.

But a man with capital can make and market other things as well as dish-washing machines. How much patent protection is the inventor able to sell to the capitalist to induce him to buy this particular patent instead of some other? Dish washing by machine is not a new idea, so the patent cannot contain a claim forbidding others to use any mechanical dish-washing process whatsoever. Further, other dish-washing devices, dish-holders of various shapes, means of moving dishes about in hot water, means of spraying hot water over dishes, have been invented and patented in great numbers. None of the machines has yet come into general use, and many have been forgotten; and yet every one of the old claims stands in the way of complete patent protection for new machines in the same field. Among all the previous patents, the present invention can hardly secure more protection than may be afforded by a claim or two on a combination of old and new ideas, and as many variations of this combination as the patent attorney has anticipated. Such a patent cannot prevent others from making a similar device, by leaving out some unimportant part mentioned in the claims, or putting in something different from a part described. Nothing but a long and expensive lawsuit can stop an imitation of the patented article. It requires careful study by men experienced in patent law to determine whether a construction is an infringement or only something similar to but essentially different from the patented device.

License to Litigate

All things considered, a comparatively small sum of real money is all that the business man is warranted in paying for the license to spend large sums in court, which is about all that the patent confers on him. Patents, in order to make money, should be held by an individual or corporation able and ready to defend its property in court and to purchase other patents as they appear, so as to dominate the field so evidently that others will observe the fact and refrain from starting an expensive and losing fight. The value of each one of the patents held by such a concern will usually be trifling, but all together the patents may be worth a very large entry on the asset side of the corporation's statement.

Evidently the chance of making any great sum of money

by the independent sale of a patent is too remote to justify a man in sacrificing pleasant relations with his employer, even if he is not bound by a contract to give up his rights in any invention he may make. But the employee should not imagine himself to be squeezed or robbed of his rights in thus parting with them without definite consideration. Intelligent workers are paid wages for what they are capable of doing, rather than for what they may actually do day by day. There is no piece-work system for paying draftsmen, designers and superintendents. Mechanics, and foremen as well, often are rated on the pay roll for other considerations than the number of pounds of chips they can produce. Outside of actual production, the consideration for basing the wages rate may be the possession of ready thought in emergency, or tact in handling associates and customers, or resource in overcoming difficulties. The employee of a well-managed organization who is able to produce ideas worth the cost of patent protection will not fail to receive a fair equivalent through the weekly or monthly pay roll.

Giving the Sherman Act Sharper Teeth

WASHINGTON, D. C., December 2, 1913.—President Wilson has deferred his recommendations on the subject of anti-trust legislation until the currency bill seems to be well on its way to passage, but Representative Henry, chairman of the House Committee on Rules and an influential Congressman, has introduced one of a series of bills designed to extend and supplement the Sherman act. This bill will probably receive considerable attention, as it is intended by its author to meet primarily the decisions of the Supreme Court of the United States upholding "reasonable" restraints of trade. Representative Henry's bill declares "every contract, combination in the form of trust or otherwise, or conspiracy, or agreement of whatever character, or combination of capital, skill or acts by two or more persons, firms, corporations, officers of corporations, or associations of persons or either two or more of them," to be a felony and punishable in the case of violation by a term in the penitentiary of not less than two years nor more than ten years. The proposed act excludes "members of organizations or associations not for profit and without capital, agricultural products or live stock in the hands of the producers or raisers" thus exempting labor unions and farmers' organizations.

The bill, which was referred to the Committee on the Judiciary, is an amendment of section 1 of the Sherman act, that relating to labor unions and agricultural organizations being an added section to the act.

W. L. C.

Advanced Scrap Freight Rates Approved

Approving the proposed advance in the rates on scrap iron from Duluth and St. Paul, Minn., to Chicago, Ill., and between other points in that section, the Interstate Commerce Commission has vacated its order of suspension against these rates as of December 15. The decision of the commission says:

"The protestants direct considerable of their testimony toward establishing the fact that in some of the tariffs under the suspension scrap iron will move at a higher rate than pig iron and new rails; that pig iron and new rails are higher grade commodities and can better bear a higher rate than scrap and that to put scrap on the same or a higher scale would be unjustly discriminatory. It does not follow that the scrap iron rates should necessarily be fixed with a definite relation to the rates on pig iron or new rails. The evidence indicates that pig iron is more easily handled and loads heavier than scrap, and that with reference to both pig iron and new rails the element of water competition enters more strongly, the record disclosing that both articles, and especially rails, move quite extensively by water."

The number of unemployed workingmen in Germany is increasing rapidly. It is stated that a committee investigating the matter in Berlin found 25,308 unemployed in 40 unions. As these unions embrace less than one-third of the wage-earners of the city, it is calculated that the total number of unemployed in that locality reaches 80,000. Reports from other parts of Germany show similar conditions.

Close to 50,000,000 Tons in 1913

Lake Iron Ore Shipments Were 49,070,500 Tons Apart from the All-Rail Movement

Returns to *The Iron Age* from the 11 iron ore shipping docks on Lake Superior and Lake Michigan show that the total movement of Lake Superior ore by water in the season of 1913 was 49,070,500 gross tons, against 47,435,777 tons in 1912, an increase of 1,634,723 tons. Only a few cargoes were loaded after December 1, most shippers having little ore to move after November 20. The total shipments after November 1 were 3,283,132 tons, while in 1912 they were 4,087,253 tons. How near the final total for the year 1913 will come to the 50,000,000 tons commonly talked of early in the season will depend on the all-rail movement, which will not be known until after January 1, being reckoned for the calendar year. Shipments to furnaces at Duluth and the various points at which charcoal furnaces are operated, together with those made from the Iron Ridge and Mayville mines in Wisconsin, were 785,000 tons in 1912, and have averaged about 800,000 tons in the past four years. If they reach that average in 1913, the year's movement will be 49,870,000 tons, or nearer to 50,000,000 tons than has been thought probable, in view of conditions in the iron trade in the past two or three months.

Shipments by ports for the season are given below, together with a comparison with the three preceding years:

Iron Ore Shipments from Upper Lake Ports—Gross Tons

	1913	1912	1911	1910
Escanaba	5,399,465	5,234,655	4,278,445	4,959,726
Marquette	3,137,618	3,296,761	2,200,380	3,248,516
Ashland	4,338,230	4,797,101	2,429,290	4,094,374
Two Harbors	10,075,718	9,370,969	6,367,537	8,271,177
Superior	13,788,343	14,240,714	9,920,490	8,414,799
Duluth	12,331,126	10,495,577	6,934,269	13,640,166
Total by lake	49,070,500	47,435,777	32,130,411	42,618,758
Total all rail		785,769	662,719	813,639
Total shipments		48,221,546	32,793,130	43,442,397

A new shipping dock was added to the list in the past season—that of the Northern Pacific Railway at Superior, Wis., in charge of J. H. Cooke, ore agent of that road. The first boat was loaded at this dock on August 24 and the total season's shipments were 31,194 tons.

As for the past two years Superior leads in shipments, the large total from that port representing the effort of the United States Steel Corporation to make up its minimum requirements under the Hill ore lease. Next year will also see heavy shipments from Superior over the Great Northern dock, on this account.

The Mesaba range this year reached a new high percentage of the total of Lake Superior ore. The Steel Corporation's percentage of the total was probably a trifle over 50. Its early season schedule for 1913 was about 26,000,000 tons, but this was reduced as conditions changed in mid-season and its final record was not far from 25,000,000 tons. In the past few years the Steel Corporation's percentage has ranged from 51 to slightly over 52.

New Blast Furnace at Chicago

The Treadwell Construction Company, Midland, Pa., has received a contract for the erection of a blast furnace and one hot blast stove for the Wisconsin Steel Company at Chicago. About 350 tons of plates and 250 tons of castings will be used in the building of the new stack. The work is now going through the shops of the Treadwell Construction Company and active work on the erection of the furnace will start early in the spring.

At the last general meeting of the Austrian Chemical Society Professor Fraenkel referred to the remarkably rapid development of autogenous welding and stated that in Germany alone between 20,000 and 22,000 tons of calcium carbide are consumed annually in oxy-acetylene welding.

The Blystone Machinery Company, Cambridge Springs, Pa., has changed its name to Blystone Mfg. Company.

Cast Iron for Machine Tool Parts*

Mixtures Used by Various Founders—Their Practice as to Chilling—Value of Chilled Surfaces

—BY HENRY M. WOOD†—

In the belief that valuable information could be secured by a comparison of the present practices of representative machine-tool manufacturers, the writer asked a number of machine-tool makers in different lines and in different sections of the country if they would be willing to submit an outline of their practice.

Mixtures Used by Representative Machine-Tool Makers

The following excerpts pertaining to the mixtures used and chemical analysis of the castings are quoted from their replies:

A Builder of Special Machine Tools: Our iron is bought on analysis specifications, covering two grades as follows:

Two plain	Per cent.
Silicon	1.75 to 2.25
Manganese	0.60 to 0.90
Phosphorus	0.50 to 0.80
Sulphur	0.05 and under
No. 3	
Silicon	1.00 to 1.50
Manganese	0.50 and over
Phosphorus	0.50 to 0.80
Sulphur	0.07 and under

In addition to the above we use materials as follows: No. 1 machinery scrap, mild steel scrap, manganese steel scrap. The last carries 12 per cent. of manganese with quantities of the other elements so small that they are negligible in gray iron foundry work. Our mixtures are figured out on the actual analysis of each car, insuring in the castings uniformity of analysis and consequently of physical characteristics, such as strength, density, and machining qualities. In general practice we use three different mixtures suited to our varying needs.

In our first mixture we include our lighter castings such as pulleys, small gears, washers, hand-wheels, brackets, and the like. In this mixture we endeavor to have the following analysis:

Silicon	1.90 per cent.
Manganese	0.60 per cent.
Phosphorus	0.70 per cent.
Sulphur	0.08 per cent.

This is usually secured by the use of a mixture of 50 per cent. of two or three lots of two plain iron and 50 per cent. of scrap. The proportions of the different pig irons are adjusted to produce the proper analysis in the mixture, and the scrap is partly our own foundry return and the balance No. 1 machinery scrap.

Our second mixture covers all our heavy work, such as planer beds, posts, tables, face plates, frames, etc. These castings require strength and sufficient density to permit the machined surface to take a high polish. These ends we accomplish by an analysis as follows:

Silicon	1.40 per cent.
Manganese	0.60 per cent.
Phosphorus	0.60 per cent.
Sulphur	0.09 per cent.

This mixture consists of 45 per cent. of two or more No. 3 irons and 55 per cent. total scrap, shop and No. 1 machinery together. Should this mixture fail to yield sufficient manganese the addition of 1 to 2 per cent. of manganese steel scrap is made to correct it.

The third mixture is semi-steel, used principally for large blank gears and castings requiring special strength. Its analysis is

Silicon	1.20 per cent.
Manganese	0.90 per cent.
Phosphorus	0.45 per cent.
Sulphur	0.09 per cent.

Its average makeup is

Machinery scrap	30 per cent.
Mild steel scrap	20 per cent.
Manganese steel scrap	5 per cent.
No. 3 pig iron	45 per cent.

*From a paper appearing in the November Journal of the American Society of Mechanical Engineers.
†Lodge & Shipley Machine Tool Company, Cincinnati, Ohio.

The above mixtures cover our entire range of work except cases where some special composition is required or desired. All materials are weighed before charging into the cupola and all due precautions are taken to insure proper melting conditions and perfect mixtures of the various materials entering into each charge.

A Manufacturer of Precision Machinery: In our work we run various grades of iron to meet the conditions existing in the machines or in the parts of machines under consideration. In a general way our mixtures, in per cent., run as follows:

	Silicon	Manganese	Phosphorus
1	3.00	0.60	0.80
2	2.40	0.65	0.70
3	2.00	0.65	0.60

The first is for the average run of castings of smaller size; the second for the larger castings. Where we need a special close-grain iron we use the third mixture.

A Manufacturer of Milling Machines: We have never carried on any extensive experiments to learn the best mixtures of cast iron for our purposes. We use in the tables, knees, saddles and vises about 20 per cent. of steel with a view to obtaining a close-grain casting, and increasing somewhat its strength. We use practically no cast iron for gears or small parts, these being made of steel, drop forged, in the case of larger parts, and also in the case of smaller parts when not adapted for manufacture from the bar.

The subject of gray-iron castings is, we believe, one of the most annoying to be found in connection with the manufacture of machine tools. Customers are not satisfied to accept machines with defective castings even though the deficiency is of such a nature as to, in no wise, impair the life or efficiency of the machine. The ideal casting is, of course, one that is so close as not to show any grain when finished and at the same time, just as hard as it can be, and be worked into shape.

The question of strength is probably not so important, as there is opportunity to use sufficient bulk to obtain strength. At any rate this is true of the parts that we make of cast iron, for, as stated above, all our gears and like parts are made from steel which is casehardened.

A Manufacturer of Heavy Lathes: With the heavier castings we are using a semi-steel mixture with about 20 per cent. of steel. The analysis of this iron shows 1.60 to 1.70 per cent. silicon, 0.65 to 0.75 per cent. manganese, 0.40 per cent. phosphorus, 0.08 to 0.10 per cent. sulphur. While our carbons are not noted as a rule, we get a check on these every once in a while, showing the total carbons about 3.50 to 3.60 per cent.

Our iron for smaller pieces runs from 1.80 to 1.90 per cent. in silicon, 0.40 to 0.50 per cent. in phosphorus, 0.65 to 0.70 per cent. in manganese, 0.07 to 0.10 per cent. in sulphur. The total carbon shows up practically the same in both mixtures. Our test bars on the first mixture break at from 2800 to 3200 and on the latter mixtures at about 2600. This refers to 1 in. x 1 in. standard bars supported on 12 in. centers.

A Manufacturer of Grinding Machines: We use castings with various proportions of steel according to the size of the casting and the place where it is to be used, so that today we have very bright lustrous surfaces and it is possible to get accurate alignment.

Practice with Reference to Chilling Castings

There is a wide difference of opinion among machine-tool manufacturers as to the desirability of chilling any surfaces of castings. The writer asked some of the representative manufacturers of various classes of machine tools for their experience on this point. The following quotations from their replies state both sides of the case:

A Manufacturer of Milling Machines: We are not using any chills at this time, though we have experimented

with these from time to time but have reached no satisfactory conclusion.

A Lathe Manufacturer: We have not used chills on any parts of our machines, which, we must concede, is from many points of view, not a very satisfactory admission to make.

A Manufacturer of Heavy Machine Tools: For quite a period, about nine or ten years ago, we chilled the ways on our lathe and also the rails on our boring mills. We found, however, after they had been out some time that there was quite a bit of trouble with the chilled surfaces scratching. It was hard for us to find exactly what was the root of the trouble and we finally gave it up. The effect of the scratching of the chilled ways was a most peculiar one, and we sometimes observed on a machine even before it had gone out that some little particle of material had settled on the way and scratched the same badly.

A Manufacturer of Grinding Machines: In regard to chilled iron, of course, you know that chilled iron means this and nothing else: It means iron that cannot be filed, planed or scraped. At least any mechanic who hears the words "chilled iron" understands it to mean just that thing, a surface that cannot be cut with tools. Now, of course, you realize that such a surface makes it impossible to get practical aligning ways on machine tools. It might just barely be possible to grind them accurately, but probably not practical to do so. We use an iron with steel mixture, and vary the mixture according to the size of the casting, and we produce a casting as dense and as hard as we can possibly plane and scrape with any surety of getting perfect alignment, because imperfect bearing and imperfect alignment is just as bad and just as sure an error as iron that would be too soft. In fact if one had iron that was exceedingly soft, and should choose to make ways which are very wide it might be more durable than one made with hard iron and smaller ways.

Another Manufacturer of Grinding Machines: The main reason for chilling the different parts of our work is to increase the wearing durability and at the same time get the advantage of refining the metal and a clean surface. The parts chilled are the guides of the carriage and the surface of the table upon which the head and tailstocks are mounted. Our method of chilling is to place plates of $\frac{5}{8}$ in. in thickness in the mold, and these give a depth of chill of about $\frac{1}{2}$ in. and a degree of hardness just to the point of where the machining can be readily done. It would be natural to suppose that this chilling would produce or increase internal strains, but on our work, such conditions have not given any trouble. Our work is not of such a nature where hammering upon it or peening is necessary. Therefore, we are unable to state just what action would take place as the result of hammer blows and peening. The chilled surfaces are very much more durable than metal in the ordinary condition, and we believe by the chilling process the durability of the surface upon which wear comes is increased at least from 300 to 400 per cent.

A Builder of Heavy Machine Tools: In 1888 we began the practice of solidifying cast-iron surfaces by introducing chill blocks in the molds, and we have continued the practice ever since. Answering your questions specifically, first, we have not discontinued the use of chilled surfaces because of any difficulty in oiling. We have never found that the fine grain of the chilled iron prevented the oil from sticking. There is no truth in the statement. We have not found any increase in internal strains due to the use of chills. On the contrary, when chills are properly placed they equalize the cooling of the heavy parts adjacent to lighter portions and reduce the internal stresses which would naturally result from the difference in time of cooling. If the chills are improperly used it would be possible, especially in thin castings, to cool the entire mass too rapidly and produce internal stresses.

We have not found that the proper use of chills makes the iron more sensitive to a peening action; in fact, we have evidence to the contrary. The chilled surface we believe to be more durable. We have cases where gearing made in this way outlasted several sets made in the old manner. The success or failure of this process depends upon the ability to produce, day in and day out, the kind of metal required, and, further, the intelligent designing of chills of iron molds so that a proper relation may al-

ways be observed between the size and shape of the casting and the thickness of the mold or chill block.

A Boring-Mill Manufacturer: We are chilling certain surfaces on our boring-mill spindles with good success, but have found no occasion for chilling any other surfaces. If we experienced difficulty due to undue wear on sliding surfaces, we would increase the area of the surfaces and supply better lubrication and protection from dirt rather than to try to chill the surfaces of these parts. The chills which we use on our spindles serve two purposes: first, by securing closer grained metal; second, by improving the quality of the wearing surfaces. We found that it was difficult to get good castings of these spindles until we did use chills.

A Builder of Special Machine Tools: Concerning chills, we would say that to some extent we are now using these on the surfaces of beds and similar castings.

A Manufacturer of Precision Machinery: We use such chills as may be necessary to give the surface in connection with the ways and moving parts.

Chilled Lathe Beds

In view of the considerable differences in opinions of the value of chilled surfaces and the idea held by some that it is impossible to chill an iron of high tensile strength without making it so hard it cannot be machined, the practice of The Lodge & Shipley Machine Tool Company, with which the writer is connected, is here outlined.

Three average analyses are as follows:

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Tensile strength, lb. per sq. in.
2.16	0.065	1.01	0.40	22,310
2.17	0.065	1.01	0.39	24,840
2.45	0.076	0.63	0.71	24,195

The first analysis is of a specimen taken in January, 1913, from the first iron run in a heat; the second, from the last iron of the same heat; the third, from the average iron of a heat in September, 1913.

This same iron is used for lathe beds of which the ways are chilled, also for other cast-iron parts which do not require the high tensile strength of semi-steel. For some parts, such as compound rest top slides and reverse plates, we use semi-steel. Parts subject to greater stress or to severe shock are made of steel.

Degree of Hardness

Scleroscope test on chilled beds finish planed but not scraped gave as a result of eight different tests on four different beds, scleroscope readings of 40 to 42 with an average of 41. Similar tests on chilled beds which had been planed and then scraped gave a practically constant scleroscope reading of 42. Comparative scleroscope tests on a heavy section of unchilled cast iron which would give as nearly as possible conditions parallel to those just quoted gave readings ranging from 18 to 22, with an average of 20.

These tests indicate that the chilled ways are twice as hard as the unchilled. The same is also shown by the planing speed, as we can only plane the chilled beds at a trifle less than half the cutting speed formerly used. In addition to the advantage gained by the hardness, the chilled beds are if anything more uniform than the unchilled. The rough beds as received from the foundry are quite straight, so that the amount of metal removed all along the ways in planing is as nearly uniform as is practicable. Then, too, the scleroscope readings indicated a more nearly constant degree of hardness on the chilled beds than on the unchilled. Fewer castings are unsound than before chills were used.

Action of the Chill

The chilled surface is produced by a series of cast-iron chill plates each about 6 in. long placed end to end in the mold. The use of separate short plates eliminates much of the warping and twisting which would occur in a long chill plate. If a thick chill plate is used with a low-silicon iron the surface of the casting is chilled so hard that it cannot be machined. The desired result is attained by regulating the thickness of the chill plate to suit the size of the casting for which it is used; then a low-silicon iron of high tensile strength can be successfully poured. The heavier the casting, the thicker the chill plate.

The action in the mold is that when the molten iron strikes the cold plate it is chilled and hardened; then the

heat in the mass of iron forming the body of the bed casting gradually warms the chilled surface and the chill plate, thus annealing the casting or "drawing the chill," just as when in tempering a chisel the heat in the shank of the chisel "draws the temper" of the cutting edge to the proper point after the cutting edge has been hardened by quenching in water. This annealing of the chilled surface of the casting produces the desired form of hard, close-grained gray iron.

The thickness of the chill plate used is such that the heat in the casting will anneal the surface sufficiently to permit planing, although at a greatly reduced cutting speed, and yet retain the benefits of the chill.

Value of Chilled Surfaces

The advantages of chilled wearing surfaces for machine tools are:

1. Much harder surfaces, which experience has proved are vastly more durable than similar unchilled surfaces.
2. A hard guiding surface with a relatively soft carriage, bringing the bulk of the wear on the carriage and thus maintaining the alignment of the guide.
3. A denser and much more closely grained surface of the casting, giving better appearance.
4. An exceptionally smooth finished surface, in which there are no pores where dirt and grit may become imbedded to cause rapid abrasion of the other bearing surface.

There are several ways of increasing the durability of working parts, such as by increasing the area of the bearing, by providing more complete lubrication, and by hardening the surfaces. All are successfully used. In general, each method may be used independently of the others. If the areas of the surfaces are as large as special conditions permit, and if the lubrication is thoroughly efficient, there would seem to be no objection to still further increasing the durability by the use of chills.

Chilled surfaces are more advantageous on some machines and some parts than on others. In the case of a lathe the carriage will often be used for long periods of time on chuck work or on short jobs between centers which brings all of the wear on a comparatively short length of the bed just in front of the headstock; such uneven wear on the unchilled bed destroys the accuracy of the alignment for long work. Chilling the ways brings the wear principally upon the carriage, and even if the carriage is worn, the alignment at all points along the bed will remain relatively true.

Only one manufacturer of all who were kind enough to reply on this subject had discontinued the use of chills; the others who are using chills do not report any trouble due to scratching. The objections to the use of chills aside from the one instance quoted, have come from foundrymen who do not and have not used chills.

Our own experience, based on the use of chilled ways on beds of all sizes of our lathes for more than two years, is that no internal stresses are created by the chilling; that the surface is not made more susceptible to a peening action; that the surface can be equally as well lubricated as before; that iron of high tensile strength is used; and that the increased hardness and closeness of grain of the chilled surface vastly increases the durability and permanency of alignment. We find no disadvantage except a somewhat increased cost.

Tensile Strengths of Various Irons

As the letters received from other machine-tool manufacturers do not state tensile strengths, the following statements regarding the general practice of Cincinnati manufacturers are quoted:

A professor of mechanical engineering and testing says: I believe the general Cincinnati machine-tool practice for good castings runs from 22,000 to 24,000 lb. per sq. in. tensile strength, but owing to the great variety I would not wish to commit myself to any particular figures.

A Cincinnati chemist states: After tabulating the results of my tests of the tensile strength of cast iron from various sources, I pick some at random to show the average run of machine-tool iron in lb. per sq. in. in this locality: 22,962; 24,090; 24,522; 23,197; 23,260.

This will give an idea of what the general run is. Good machineable iron, where the grain does not have to be too close for machine-tool work, should run from 20,000 to 26,000 lb. per sq. in. Low tensile strength is due to too much silicon, sulphur, or phosphorus.

Conclusions

Chilled surfaces for certain parts are desirable. There might be a limited field for special alloy castings and if any machine-tool manufacturers have experimented with them, the results of their tests would be welcome. There is a wide difference in the chemical analyses of irons used by representative manufacturers—this last circumstance may be due to the different melting conditions in the several foundries; or it may indicate a field where much good could be accomplished by a more complete interchange of information, and by experiments to determine the best mixtures for different purposes.

Mechanical Engineers Meet

The idea that national engineering societies ought properly to have much to suggest to technical schools in regard to the shaping of their educational programmes was a point made by Dr. W. F. M. Goss in his presidential address before the American Society of Mechanical Engineers, Tuesday evening. With the reading of this address, entitled "Efficiency in Technical Education a Factor in the Development of Professional Ideals," the annual meeting of the society was opened. The meeting is in progress as this issue goes to press and the programme, the wide scope of which has already been mentioned in these columns, covers also Thursday and Friday. On the completion of Dr. Goss's address, leading thoughts of which are here subjoined, Secretary Calvin W. Rice suggested the probability of the appointment of a committee from the society on technical education.

The American technical school stands to-day on the threshold of great achievements. Its pioneer days are nearly over. Public confidence in the new education has been won and its permanent support is assured.

Great leaders in the work of the technical school are few. An important reason is to be found in the limitations which have been put upon the salary budget. In the industries a man may receive in a month an amount equivalent to the annual salary of many college professors. Few among American technical schools can to-day offer professorships which in themselves are sufficiently attractive to justify a young man in securing for himself the elaborate preparation necessary. The American youth is greatly influenced by the personality of his instructor. The great teacher, freed from the burden of excessive routine, may easily recognize differences in ability and will encourage the students who must plod and inspire to unusual performance the brilliant student who knows no limit to his achievement save his physical strength.

Much that is now studied may perhaps be read. The habit of studying intensely a few books to the entire exclusion of the great mass of historical and biographical engineering literature affords the student but little opportunity of acquiring a habit of rapid and intelligent reading, which in itself is an accomplishment worth striving for. The years in college must be spent in acquiring an understanding of principles and in the development of those aspects of theory which are difficult to acquire after one's college days are over.

The laboratories of a considerable number of schools have made important contributions to the sum of human knowledge and the technical school must enshroud its classroom and its laboratories with an atmosphere of scientific achievement; its professors should be leaders not only as classroom instructors, but nation-wide leaders, even world-wide leaders, in the complex and highly diversified fields of the science which they represent. The technical school constitutes the most promising agency in our national economy. The fact that educational institutions of high standing are sending out each year into the engineering pursuits of our country more than 2500 graduates, nearly 1000 of whom enter the field of mechanical engineering, suggests to what degree the technical school is recruiting and otherwise stimulating the engineering work of the country.

The American engineer who has hitherto been occupied with the so-called practical aspects of his profession has concerned himself less than have the engineers of the great empire across the sea, with the work of the scientist. We, as engineers, need to train ourselves to a condition of mind which will make studious processes less difficult than

at present. In the development of our future ideals and practices, tradition and prejudice are likely to play a steadily diminishing part, and the spirit of fellowship, inherited from college days, a part of steadily increasing importance.

Better instruction in the school must supply better recruits for the profession, greater activities in scientific researches on the part of the school must operate to increase the facility with which the problems of the engineer are solved, and influences in the school which tend to extend the student's horizon and broaden his sympathies, will in due time make their impress upon the professional life outside of the school. I believe that the problems of the technical school should not be left to the school master, for, broadly interpreted, they are not the problems of the school but the problems of the profession.

Change in Society's Publications

At the Wednesday morning meeting the report of the council was presented. This showed the growing interest of the membership at large, particularly in committee work. The society is in a remarkably strong financial position, having assets of over \$650,000 and a working capital of about \$40,000. It has had a net increase in membership of 486 members, 158 juniors, and a total net increase of 644, making the total membership on October 1 1908. One of the important announcements was that of the publication committee, in part as follows:

The committee believes that the papers should be published in the numbers following a meeting, instead of in advance, enabling the papers and discussion to be brought together in the form of reports, and presented in the same manner in which any technical journal would deal with the affairs of the day. The Journal can be made to render a greater service to the membership and would be more inviting to the reader if issued in the standard 9 by 12 in. size already used by some technical societies, and now coming to be adopted so generally by the technical press in this country and to some extent abroad.

At this writing reports on standardized threads for hose couplings and on pipe-thread gauges have been accepted. The report on the standardization of flanges, representing a compromise between 90 per cent. of the manufacturers and the society's committee, was discussed adversely by E. B. Denny, Newark, N. J., president of the National Association of the Master Steam and Hot Water Fitters; N. L. Danforth, Buffalo, N. Y., also in behalf of that organization, and by Secretary Henry B. Gomers of that association. E. T. Child stated that there are over 250 changes from the so-called 1912 U. S. standard. Major Macfarland, Babcock & Wilcox Company, told how the valve and fittings manufacturers did not indicate any desire to cooperate until after this recent standard was promulgated and he felt H. G. Stott, chairman of the society's committee on the flange question, was justified in working with the manufacturers to draw all interests together, if possible. Mr. Stott defied any one to show that the changes in the standard mentioned are not consistent with good engineering. After a long discussion it was voted to postpone until a later meeting the acceptance of the standard flange report.

Obituary

ALFRED H. PEASE, Hartford, Conn., president of the Hart & Hegeman Mfg. Company, manufacturer of electrical specialties, died suddenly November 27, aged 49 years. He was a native of Hartford, and after graduating from the high school was engaged in the wholesale dry goods business for 10 years, until 1892, when he was made treasurer of the Hart & Hegeman Company and a few years ago became its president. He leaves a widow and four children.

ROBERT C. TOTTEN, Pittsburgh, died December 1, aged 81 years. He was born in Pittsburgh. He organized the Fort Pitt Foundry, later known as Totten & Co., and still later as the Totten & Hogg Iron & Steel Foundry Company. He was a member of the firm of Kay, Totten & Powell, patent attorneys, Frick Annex Building. He leaves a widow, one son and four daughters.

The Duchess Mfg. Company, Poughkeepsie, N. Y., has let the contract for an addition to its factory for the manufacture of overalls, etc.

Personal

W. L. Saunders, chairman Ingersoll-Rand Company, entertained Secretary of War Garrison, Mayor Kline of New York City, the New York and New Jersey Harbor commissioners, the United States Harbor Line Board, and a number of others at luncheon at the Machinery Club, 50 Church street, New York, November 28. Mr. Saunders is president of the Machinery Club and a member of the New Jersey Harbor Commission. The luncheon was preliminary to an inspection by the party of the water front on the New Jersey side of the Hudson River.

President James A. Farrell, of the United States Steel Corporation, addressed the Illinois Manufacturers' Association at its annual dinner at the Congress Hotel, Chicago Wednesday evening, December 3. Later in the week he will visit the Illinois plants of the American Steel & Wire Company in connection with the inspection trip of the officers of that company.

C. T. Needham, M.P., of John Needham & Sons, dealers in iron and steel, Manchester, England, sailed from New York on the Lusitania, December 3, after a short business trip to Canada and the United States.

Alex. S. Mitchell, 45 Broadway, New York City, has been appointed by the Massillon Rolling Mill Company, Massillon, Ohio, as its sales agent for the metropolitan district. For a long time Mr. Mitchell has been identified with the iron and steel business of the East, beginning with Wm. H. Wallace & Co., and following with A. & P. Roberts & Co., the American Bridge Company, and the Eastern Steel Company. His position with the last-named company was in charge of its New York sales offices, from 1905 to 1907, when his health broke down, and he resigned and traveled for about a year. In 1908 he secured the agency of the Champion Rivet Company, which he still retains and will handle in connection with the account of the Massillon Rolling Mill Company, which manufactures special sheets for automobiles, stoves and other lines requiring a high class product.

W. R. Stelling, sales manager and advertising director of the Gilson Mfg. Company, Port Washington, Wis., has resigned to accept an identical position with the Steiner Mfg. Company, Chilton, Wis., recently reorganized. Both concerns manufacture gasoline engines and power farm machinery.

Walter Deakin, managing director of H. W. Ward & Co., Birmingham, England, machine tool makers, spent several days last week inspecting a number of plants in Cincinnati, Ohio. He expects to sail from New York for home this week.

Floyd F. Taylor, formerly Detroit salesman for the Anderson Forge & Machine Company, has been appointed Detroit representative of the Carbon Steel Company, Pittsburgh, Pa.

J. E. Weckler, formerly superintendent of the Mesta Machine Company, has been appointed superintendent of the plant of the United States Brass & Foundry Company, Flint, Mich.

An unusual mark of appreciation for long service was shown recently to Charles Matthews, employed for 25 years by the Aluminum Company of America at New Kensington, Pa. R. A. Hunt, superintendent of the Aluminum Cooking Utensil Company, an identified interest, on behalf of the company presented Mr. Matthews with 100 five dollar bills, and he was granted a vacation of a month with full pay.

H. L. Warner, formerly of Muncie, Ind., has affiliated himself with the Detroit Standard Gear Company, Detroit, Mich., which is now prepared to furnish makers of automobiles, motor trucks and cyclecars with a complete line of sliding gear and planetary transmissions, differential gears, bevel gears, etc.

A train load of 35 cars of cranes and other steel plant equipment will be shipped via New York City by the Alliance Machine Company, Alliance, Ohio, about December 10, to the Broken Hills Proprietary Company, New Castle, Australia.

Judicial Decisions of Interest to Manufacturers

ABSTRACTED BY A. L. H. STREET

EFFECT OF AGREEMENT TO FURNISH GAS FOR FUEL.—An agreement by a gas company to furnish natural gas for a manufacturer's use as fuel, at a pressure not exceeding 8 oz., bound the company to furnish a pressure of at least 6 oz., a pressure necessary for proper operation of the plant in which the gas was used. The contract, by referring to correspondence as a part of the agreement, including a letter in which the company offered to furnish gas according to the terms of its "regular contract," made those terms a part of the particular contract, so far as those terms were then in force in the company's regular form of contract, not including new terms afterward adopted. (Pennsylvania Supreme Court, Clairton Steel Company vs. Manufacturers' Light & Heat Company, 87 Atlantic Reporter 998.)

VALIDITY OF CORPORATE MORTGAGE.—Only stockholders of a corporation, and not the company itself, can, on suit against it to foreclose a mortgage covering the corporate property, set up a defense that the mortgage was executed without authority from the stockholders, in cases where such authority is necessary. (Colorado Court of Appeals, Firestone Coal Company vs. McKissick, 134 Pacific Reporter 147.)

INFRINGEMENT OF PATENTS.—The fact that a patent is granted on a device similar to one previously patented is prima facie evidence that there is sufficient difference between the two to avoid any infringement. (United States District Court, Crowe vs. Oscar Barnett Foundry Company, 206 Federal Reporter 164.)

EMPLOYER'S DUTY TO INSPECT MACHINERY.—The fact that an employee injured at a machine had worked at it for two years does not relieve the employer from liability for injury resulting from negligent failure to inspect the machine and repair any defective condition, even though the defect was in a spring which was in full view of the workman, it appearing that the machine had not been inspected for four years, and had previously failed to work properly. (Pennsylvania Supreme Court, Eldridge vs. Fell Mfg. Company, 87 Atlantic Reporter 966.)

CONTRACT INVALID FOR WANT OF MUTUALITY.—A contract between a manufacturer and a steamship company for the transportation of freight to a foreign country was unenforceable against the manufacturer, where the agreement lacked mutuality of obligation, in that under its terms the steamship company was not bound to accept and forward consignments embraced in the contract. (United States Circuit Court of Appeals, Seventh Circuit, Tweedie Trading Company vs. Parlin & Orendorff Company, 204 Federal Reporter 50.)

BUYER'S RIGHT TO COUNTERMAND ORDER.—Where an order for goods recites that it shall not be binding upon the seller until accepted by him, the buyer is entitled to countermand the order any time before it is accepted, though it contains a clause stating that it is not subject to countermand. (Iowa Supreme Court, Hargrove vs. Crawford, 141 Northwestern Reporter 423.)

ABANDONMENT OF TRADEMARKS.—The owner of a trademark will not be deemed to have abandoned his right to its exclusive use, in the absence of facts clearly showing such intention. (United States Circuit Court of Appeals, Fifth Circuit, Metcalf vs. Hanover Star Milling Company, 204 Federal Reporter 211.)

SELLER'S LIABILITY FOR DELAY IN DELIVERY.—The fact that a manufacturing company which contracted to sell electric motors to another company had knowledge that they had been resold by the latter under an agreement requiring delivery within a specified time under penalty of a forfeiture of \$20 a day for delay in delivery did not bind the manufacturing company, under pain of a like penalty, to deliver the motors in time for redelivery to the buyer's buyer within the time fixed by the contract of resale. (Pennsylvania Supreme Court, General Electric Company vs. Camden Iron Works, 86 Atlantic Reporter 1012.)

CHECK AS FULL SETTLEMENT.—If a creditor accepts a check bearing a recital that it is given in "full payment of account for the months of June and July," the acceptance constitutes a final settlement of the account for those months. (Texas Court of Civil Appeals, Bergman Produce Company vs. Brown, 156 Southwestern Reporter 1102.)

PLACE FOR PAYMENT FOR GOODS.—When a contract to sell goods does not provide where payment of the price is to be made, the seller may require payment at his place of business, if that is within the State. (West Virginia Supreme Court of Appeals, Danser vs. Dorr, 78 Southwestern Reporter 367.)

CARE REQUIRED CONCERNING FOUNDRY APPLIANCES.—A foundry company is under duty toward its employees to

use reasonable care to supply them with reasonably safe molds and arbors, and, in placing them in a common pile to be taken to the molders, to furnish only those that are reasonably safe. The company cannot avoid liability for injury resulting from breach of the duty by delegating performance of the duty to an employee. But if any defect is apparent to the employee who uses an appliance he assumes the risk of using it whether he or another employee made the selection. (Alabama Supreme Court, Coosa Pipe Foundry Company vs. Poindexter, 62 Southern Reporter 104.)

RISK ASSUMED BY FOUNDRY LABORER.—A foundry laborer assumed the risk of his clothing becoming ignited from a crucible containing molten metal, which he was carrying in violation of a custom against one man carrying two crucibles in succession, on account of the intense heat radiating from them. (Massachusetts Supreme Judicial Court, Sakas vs. Lumsden & Van Stone Company, 102 Northwestern Reporter 65.)

LIABILITY CONCERNING UNGUARDED MACHINERY.—To charge an employer with liability for injury to a workman resulting from the former's failure to guard machinery, as required by statute, it is immaterial whether a considerable number of careful and experienced persons in a given line of employment approve the particular guard omitted. (Indiana Supreme Court, Jeffersonville Mfg. Company vs. Holden, 102 Northwestern Reporter 21.)

POWER TO CONTROL SALE OF PATENTED ARTICLES.—A buyer of a patented machine from an agent authorized to make the sale at the place where it is made becomes the absolute owner of the machine, with an unrestricted right to resell it at any time and anywhere, notwithstanding the fact that the resale may be made in territory which has been exclusively assigned by the patentee to another. (United States District Court, Western District of Tennessee, Free Sewing Machine Company vs. Bry Block Mercantile Company, 204 Federal Reporter 632.)

INTERPRETATION OF CONTRACTS AND WARRANTIES.—When a contract to sell machinery is prepared by the selling manufacturer, and is doubtful as to the meaning of its terms, it will be construed most strongly against him. Warranty in a sale of an engine, "horse power developed at 275 r.p.m. 150 actual h.p.," is of gross power, and not of net power, when geared to machinery, unless it appears that the seller represented that the power was to be net, or that he was notified that the buyer required that capacity. A manufacturer in selling a thing which he knows is intended for a particular use impliedly warrants that it is reasonably fit for that use, the warranty extending particularly to latent defects. But where a contract of sale contains an express warranty no warranty by implication arises. (Indiana Supreme Court, Winnemucca Water & Light Company vs. Model Gas Engine Works, 101 Northwestern Reporter 1007.)

POWER TO ISSUE STOCK FOR PROMOTION SERVICES.—On organization of a company under the New York stock corporation law, shares may not be issued for promotion services, and directors who vote themselves stock for such services are liable to the creditors of the corporation for its value. (New York Supreme Court, Fourth Appellate Division, Lamphear vs. Lang, 141 New York Supplement 967.)

RIGHT TO INTEREST ON PRICE.—BURDEN OF PROOF AS TO WARRANTY.—Under a statute allowing interest on an amount of money due on a written instrument, a balance due on a written contract to purchase machinery which the buyer has accepted bears interest from the time the unpaid part of the price became due. In suing for the price of goods, a seller need not show compliance with any warranty made by him, the burden being on the buyer to show existence and breach of the warranty. (Indiana Supreme Court, Sanderson vs. Trump Mfg. Company, 102 Northwestern Reporter 3.)

INJURY TO EMPLOYEE AT HOISTING APPARATUS.—If injury to an employee while engaged in adjusting clevis pins in hoisting operations resulted from his failure to properly insert a pin, thus permitting a core to fall, he cannot recover against his employer. (Alabama Supreme Court, American Cast Iron Pipe Company vs. Landrum, 62 Southern Reporter 757.)

WHEN COGWHEELS MUST BE GUARDED.—Statutory requirement that the cogwheels of a machine be guarded, to avoid injury to workmen, is sufficiently complied with, if they are so situated and protected by other parts of the machine that injury to a workman therefrom, in the ordinary performance of his duties, would not reasonably be foreseen. A workman engaged in oiling machinery does not assume the risk of being injured through having his hand caught in cogwheels left unguarded in violation of law. (Indiana Appellate Court, Kingan & Company vs. Gleason, 101 Northwestern Reporter 1027.)

The Machinery Markets

No changes of importance are found in the general machinery trade and quiet is the rule. Machine tool manufacturers probably are feeling the lessened demand more than those in other lines, but a good part of the trade is trying to put the best possible face on the situation, though their anxious optimism is not very convincing. In New York dullness continues, but two or three dealers have found a slightly improved tone. Business in machinery is slow in New England and the supply trade is quiet also, though not to the same degree; all buying being of the hand-to-mouth kind. The machine tool business in Philadelphia continues depressed, partly because railroad buying is at a standstill. Some lines of machinery are in good demand in Cleveland in spite of the dullness in the machine tool market. Buying for export was only fair in Cincinnati, but it is slightly improved over the previous week. In Detroit consumers are conservative and the range of requirements is narrow, making business for the past month unsatisfactory. In Milwaukee, November business was under that of the previous month and of the same month a year ago. Some lines are holding up fairly well in the Central South, though business generally is quiet, the situation being attributed largely to the tightness of money. The machine tool demand is sluggish in St. Louis, with the business consisting of small orders. Gasoline engines and small pumps are selling in a satisfactory way in Birmingham, but otherwise trade is slow. Municipal enterprises in Texas have helped to make things better there, but on the whole quiet prevails. On the Pacific coast the machine tool trade is inactive, but the overhauling of mills and camps promises a better demand for equipment.

New York

NEW YORK, December 3, 1913.

The market continues quiet in respect to both sales and inquiries. Of the latter some dealers have several in their files, but they are mostly small and scattered and little disposition is shown to close them. One or two in the trade say that with them there is indication of a slightly improved tone, but the majority see no better tendency in the market. Advices received by some salesmen show a desire on the part of their home offices to cut down expenses and it is likely that for a few weeks there will be less extensive traveling. This trend is further disclosed by the fact that while some substantial manufacturing plants are not laying men off, they are not replacing those who leave for one reason or another, and with these companies stock is accumulating. The Chesapeake & Ohio Railway has an inquiry out for a 42-in. boring mill and a power hammer. Other inquiries which have been put out in recent weeks by the New York Central and the Pennsylvania have never been closed.

Bids will be received by George McAneny, borough president, New York City, until December 4 for a water supply and plumbing plant at the municipal asphalt plant.

The J. B. Lyon Company, Albany, J. B. Lyon, president, is receiving bids on revised plans for its new factory building, 108 x 120 x 88 ft., triangular in shape, five stories and basement.

The Wayne Power Company, Sodus, N. Y., will be in the market during the winter for substation equipment and transformers for the Atlanta-Naples extension of its lines. G. R. Mills is president.

Shipp & Osburn, Saratoga Springs, N. Y., have completed plans for a lumber mill, 50 x 130 ft., which they will erect this winter.

The Hall Ice Cream Company, Glens Falls, N. Y., will build and equip a two-story ice cream factory about 45 x 90 ft.

J. E. Sawyer & Co., Glens Falls, N. Y., are having plans prepared for a three-story warehouse and factory, 50 x 150 ft., which they will erect at once.

The Hansel Mfg. Company, Inc., Rochester, N. Y., has been incorporated with a capital stock of \$25,000 to manufacture automobile parts. It is probable the company's plant will be located in East Rochester. W. H. Cole, W. E. and B. B. Hansel, 1 Cornell street, Rochester, are the incorporators.

Plans are being prepared for the rebuilding of the plant of the Feed & Supply Company, Antwerp, N. Y. The estimated cost of the new plant is \$30,000.

Plans are being prepared for the rebuilding of the plant of G. Levor & Co., Gloversville, N. Y., which was recently destroyed by fire with large loss on buildings and machinery. The offices of the company are at 90 Gold street, New York City.

The F. S. & D. Mfg. Company, Syracuse, has been incorporated by James W. Farrar, Allen H. Smith and George H. Deas to manufacture aluminum and brass goods.

The Orange County Light Company, Middletown, N. Y., will be in the market the fore part of next year

for an open feed-water heater and boiler feed pump for the equipment of 100-hp. boilers. Laurent Heaton is the manager.

The Municipal Electric Light plant, Little Valley, N. Y., will soon take steps to purchase equipment comprising one four-cylinder gas engine, 150 hp., one single-phase motor, 15 to 20 hp., and one two-stage centrifugal pump. G. S. Boller is superintendent.

The Oneonta Light & Power Company, Oneonta, N. Y., will, during the winter, install a 250-hp. steam engine and a 250-hp. boiler. G. H. Lane is the general manager.

The East Rochester Packing Company, East Rochester, N. Y., has let the contract for the erection of its plant, which is to be west of the American Piano Company's factory on the south side of the New York Central Railroad. Asbestos and rubber packing will be manufactured. W. D. Smith is president; Charles Lebrecht, secretary, and A. T. Jones, treasurer.

The Herr Mfg. Company, Buffalo, has been incorporated by Ray M. Stanley, 405 Jersey street, Henry C. and Harvey E. Herr, and will build a shop for the manufacture of patterns, fillets and foundry supplies. Harvey E. Herr is the president.

The Pennsylvania Railroad Company will add to its car shop and yard plant at Babcock street, Buffalo, a building to be used as a wheel shop.

The American Body Company, Buffalo, manufacturer of automobile bodies and equipment is building an addition to its plant at Niagara street and Auburn avenue.

New England

BOSTON, MASS., December 1, 1913.

The machinery business continues dull, and the supply trade is experiencing somewhat the same condition, though not to the same degree. Buying everywhere is from hand to mouth. The banks maintain the same conservative attitude as to loans. Money is somewhat easier, however, and the expectation seems to be that the coming year will see a real improvement in this factor of the situation.

The textile industry is showing no serious results from the new tariff. The great mills of the Whittall Carpet Company, Worcester, Mass., have just gone on full time, with full working force, after running at reduced capacity for several months, waiting the final removal of the duty on raw materials. The textile workers at Fall River, Mass., are making a demand for higher wages.

Announcement is made that New England will have the important transportation advantage of the Cape Cod Canal beginning next summer. The formal opening will be on July 4. The waterway will cut the cape from the head of Buzzard's Bay to Sandwich on Massachusetts Bay, and will not only reduce the time for coastwise vessels, but will remove a very large part of the hazard.

The Union Caliper Company, Orange, Mass., has purchased the business of the Bates Mfg. Company.

Fitchburg, and Leominster, Mass., and Rutland, Vt., manufacturer of mechanics' tools, and plans to concentrate manufacturing at Orange, giving up the several factories of the Bates Company. The latter's line supplements that of the Union Caliper Company, making it much more complete. The Union company has increased its capital from \$50,000 to \$150,000, and proposes to add to its factory in the near future in order to provide the proper manufacturing facilities.

The American Brass Company is planning to erect a large casting shop as an addition to the plant of the Coe Brass Company, Torrington, Conn. The project has been under consideration for several years, and has been delayed, in part at least, because of experiments which have been in progress in the art of brass casting. The new building will be given the most up-to-date equipment. The date of beginning construction has not been decided and will depend somewhat upon the development of the general business situation.

Thomas J. Curtin, New Britain, Conn., for a long time superintendent of the works of the Corbin Screw Corporation division of the American Hardware Corporation, has identified himself with a new screw manufacturing company which will establish works in Canada. The business will be carried on under the name of the Canadian Screw & Wire Company, with a capital stock of \$500,000, and a plant costing \$150,000.

A large building in Worcester, Mass., until recently occupied as a hotel, will be converted to the purposes of manufacturing by Philip H. Duprey.

The Waterhead Mills, Lowell, Mass., will extend its main building at a cost of about \$15,000.

The Blake Hydraulic Valve Corporation, manufacturer of self-closing faucets, is planning to establish a factory at New Bedford, Mass. E. B. Wadsworth, Boston, is the president, and George A. Blake, New Bedford, the treasurer.

The Russell Mfg. Company, Middletown, Conn., will build a one-story addition, 50 by 80 ft.

The Farist Steel Company, Bridgeport, Conn., will rebuild its large boiler house which was burned recently. The structure will be of steel and concrete.

The Kerite Insulated Wire & Cable Company, Seymour, Conn., has awarded the contract for an additional factory, 65 by 150 ft., three stories and basement, of brick.

The Waterbury Scrap Iron Company, Waterbury, Conn., has been incorporated with \$10,000 paid in capital, to deal in tanks, boilers, etc. The incorporators are Michael E. Keeley, Michael Keeley and Thomas L. McPartland, all of Waterbury.

Philadelphia

PHILADELPHIA, PA., December 1, 1913.

Business in the machine tool trade continues depressed with little prospect of material improvement this month. After every effort, it is difficult for sellers to get business up to 50 per cent. of normal. The bulk of the sales are small; the larger industrial plants, operating as a rule on short time, being almost entirely out of the market. Railroad buying has been practically at a standstill. Very few inquiries for anything beyond single tools come out and some sellers advise that even this class of demand has been growing smaller. Boilers and engines have been in lighter demand both in new and second-hand equipment. The second-hand machinery market is dull. Gray-iron foundries are beginning to feel the lighter demand while steel foundries find no betterment in the heretofore unsatisfactory conditions.

Application for a receiver has been made for the John Buckley Hub, Spoke & Wheel Company, 969 North Second street, by various creditors. The company claims sufficient assets to meet its obligations if not pressed to a forced sale.

The contract for the new 21-story office building to be erected at 1420 to 1428 South Penn Square for the Finance Company of Pennsylvania has been let to the James G. Doak Company. The Hoffman Company is the architect.

Local contractors are estimating on plans and specifications for a two-story power house, 64 x 83 ft., to be erected in Richmond, Va., for Richmond College, from plans by Crain, Goodhue & Ferguson, architects and engineers.

J. J. Mulconroy, manufacturer of rubber goods, is having plans prepared for extensive improvements to the present factory and laboratory building in this city, details of which are not yet available.

The Keystone Lantern Company, Germantown, has purchased a site of two and three-quarter acres at

Collman and Tacony streets, Tacony, Pa., on which it will ultimately erect a large manufacturing plant. Plans for the new building have not yet been started and it is undecided as to just when the new plant will be erected.

Herman Miller, engineer, Crozer Building, has plans in preparation for a three-story factory building, 46 x 100 ft. The building will be of reinforced concrete and brick with metal sash. Information as to the purpose for which the building will be used is not available.

J. M. Africa, engineer, Huntingdon, Pa., is reported to be preparing plans for the erection of a \$40,000 municipal filtration plant for that city.

Alexander Merchant, New Brunswick, N. J., is preparing plans for a one-story concrete and brick mill building, 200 x 200 ft., to be erected at Carlisle, Pa., for the Interwoven Stocking Company, Martinsburg, W. Va. It is understood that the engineer will be ready for bids in about six weeks.

The contract for the construction of a sewage disposal plant, with tanks, irrigation distribution field, force mains, etc., for the State Home for Feeble-Minded Women, Vineland, N. J., has been let to the Suburban Engineering Company of New York City. W. W. Young, Drexel Building, Philadelphia, is the engineer.

It is reported that John D. Stewart, proprietor of the Seaford Iron Works, Seaford, Del., is preparing to erect a larger and modern plant adjoining the present one.

The G. A. Anderson Mfg. Company, 506 Munsey Building, Baltimore, has been organized to manufacture and deal in fire apparatus and supplies generally. The company will specialize in manufacturing the patented fire apparatus inventions of the president of the company, G. A. Anderson. A new plant, consisting of foundry and finishing departments, both electrically operated, will be equipped. E. B. Cockrell is secretary and treasurer.

Chicago

CHICAGO, ILL., December 1, 1913.

The C. F. Massey Company, 122 South Michigan avenue, Chicago, manufacturer of battery receptacles, has acquired a three-acre site at Spokane, Wash., upon which a plant, 60 x 100 ft., will be built. An initial expenditure for plant and machinery of \$25,000 is contemplated.

The Central Architectural Iron Works, 3111 West Twenty-seventh street, Chicago, has taken out a building permit covering the erection of a two-story brick addition.

The Galena Signal Oil Company will expend \$50,000 in the establishment of a branch plant at Clearing, (Sixty-sixth street and Fifty-eighth avenue), Chicago. The principal office of the company is at Franklin, Pa.

The Standard Galvanizing Company, Chicago, has been incorporated with a capital stock of \$35,000 by J. G. Goodhue, 538 South Clark street, Henry W. Huntley and John M. O'Grady. The company will conduct a galvanizing and manufacturing business.

Bids will be received by J. F. Neil, secretary, South Park commissioners, Chicago, until December 17 for a centrifugal pump of 5,000,000-gal. capacity.

The American 3-Way Prism Company, 3646 South Ashland avenue, Chicago, is taking bids on a factory that will be erected at La Porte, Ind. The proposed structure will be two stories, 140 x 160 ft., of reinforced concrete construction. Nothing is known as to equipment requirements.

The Herrin Ice & Cold Storage Company, Herrin, Ill., has been incorporated with a capital stock of \$40,000 by George S. C. D and B. I. Cook.

The power plant of the Oak Ridge mine of the Southern Illinois Coal & Coke Company, Herrin, Ill., was burned Sunday, November 23, with a loss of \$15,000. It will be replaced at once.

The Cyclone Fence Company, North Chicago, Ill., has increased its capital stock from \$100,000 to \$750,000 to provide for the new addition to its plant and its rapidly expanding business.

The Hayton Pump Company, Quincy, Ill., manufacturer of centrifugal pumps, punch presses and other machinery, has completed an addition to its plant a part of which will be occupied by the Dayton-Dick Company, manufacturer of electrical specialties.

The Marquette Cement Company, La Salle, Ill., has made plans for improvements and extensions to its plant for which an expenditure of \$400,000 is contemplated. New Power plant equipment will be installed as well as crushing and grinding machinery.

The Eagle Claw Wrench Company, whose office has been at 36 West Randolph street, Chicago, has moved its headquarters to Rockford, Ill., where plans for the building of a plant are under way.

The municipal lighting plant at Aurora, Ill., is to be enlarged and electrical machinery increasing the capacity two or three times is to be installed.

The Pennsylvania Railroad Company has begun work on the erection of new car shops on the property purchased some time ago between Whiting and Indiana Harbor, Ind. Most of its steel car repair work will be done in the shops when completed.

Bids will be received by A. H. Kennedy, Rockport, Ind., until about January 1 for a water and electric light plant for Mitchell, Ind.

Bids will be received by J. O. Kilbourne, city clerk, Winfield, Iowa, until about January 15 for a water system.

An electrical light plant will be erected at Correctionville, Iowa. Address the president of the council.

The Independent Machine Company, Manning, Iowa, has been incorporated with a capital of \$15,000 by R. C. Stuedman, Andrew Boss and H. H. Derner.

The Central Foundry Company, Marshalltown, Iowa, has been incorporated with a capital of \$6,000 by R. H. McDowell, who is president and general manager; E. H. Keller, secretary and treasurer, and Thomas Kopp, of Salem, Ohio. The new company will operate a commercial foundry and specialize in light castings.

The Brandt Mfg. Company, Minneapolis, Minn., maker of orchard and paint sprayers, etc., has let a contract for the erection of a \$10,000 addition to its plant at Hastings, Minn.

Bids will be received by A. C. Moore, engineer, Joplin, Mo., until about December 16 for a water system for Arma, Kan.

The Vaughn-Harris Company, Pierre, S. D., has been incorporated with a capital of \$25,000 by M. A. and R. E. Vaughn and George O. Harris. The new company will manufacture a radius rod truss for use on automobiles.

Detroit

DETROIT, MICH., December 1, 1913.

Business for the past month has, generally speaking, been rather unsatisfactory; orders have been small individually and totaled a smaller volume than the previous month. Thanksgiving breaking into the past week had a quieting effect on the trade and little business was transacted. The market is extremely conservative and the range of requirements is narrow. A considerable amount of second-hand equipment has been thrown on the market recently through receivers' sales and other sources and dealers report some activity in this class of equipment. There does not appear to be any new business of importance in view. A decreased demand is noted in the foundry trade. Building operations continue on an even basis but with a notable lack of new work in industrial construction.

The large factory owned and occupied in part by the Yeomans Box Company, Detroit, was destroyed by fire November 22, with a loss estimated at \$200,000. The loss to the stock and machinery of the Yeomans-Diver Company will reach nearly \$100,000. Five other companies which were also housed in the building suffered considerable damage. The concerns affected were the Climax Specialty Company, S. J. Copeland Saw Works, Detroit-Jackson Cushion Spring Company, Casey Mfg. Company and John M. Diver Company.

The stockholders of the Edison Illuminating Company, Detroit, have been asked to vote to increase the capital stock of the company from \$15,000,000 to \$25,000,000 and to ratify the issue of \$6,000,000 in bonds. The company has purchased 27 acres of land in the eastern part of the city on which it will erect a duplicate of its present plant to facilitate the distribution of its power. The stockholders' meeting will be held December 17.

Pollmar & Ropes, architects, Detroit, have awarded contracts for the erection of a large three-story factory building of brick construction for I. L. Scheinmann.

Fire badly damaged the plant of the Ideal Register & Metallic Furniture Company, Detroit, on November 24. Details as to the damage and plans of the company are not yet available.

Shops of the Grand Trunk Railroad at Port Huron, Mich., were almost totally destroyed by fire November 26, resulting in a loss of over \$1,000,000. The buildings included carbuilding and repair shops and machine

shops. Definite information as to the rebuilding of the shops is not available at this time.

The Flyer Automobile Company, Detroit, will, it is announced, soon begin the erection of a manufacturing plant at Mt. Clemens, Mich. A. A. Gloetzner is general manager.

F. D. Tappan, Grand Rapids, Mich., will erect a factory building, 50 x 200 ft., at Holland, Mich., for use as a shoe manufacturing plant.

The Compostone Company, Grand Rapids, Mich., has been incorporated with \$15,000 capital stock to manufacture composition stone. Thomas H. Talpey is the principal stockholder.

Milwaukee

MILWAUKEE, WIS., December 1, 1913.

The volume of business in November showed a falling off as compared with the previous month and with November, 1912. Bookings ahead are likewise of smaller bulk, and on the whole the situation is less favorable than a year ago. Machinery manufacturers insist that the new year should develop much new business that is now hanging fire because of unfavorable conditions. Tool builders are maintaining their position well. The report of the state industrial commission is none too encouraging, help wanted at Milwaukee, for instance, having decreased 20 per cent. and applications for employment increasing 70 per cent.

The plant and assets of the Beaver Dam Malleable Iron Company, bankrupt, Beaver Dam, Wis., will be sold at receiver's sale in Milwaukee, December 8. The creditors will meet December 10. The bondholders strenuously objected to the order of sale but to no avail. Ernest E. Smythe is receiver and is operating the three plants at Beaver Dam as a going concern.

The Wisconsin Machinery & Mfg. Company, 725 Canal street, Milwaukee, manufacturer of valveless marine motors and detachable rowboat motors, has purchased a site at Fifty-second avenue and Burnham street in West Allis and will immediately erect a new plant to cost about \$25,000, so arranged as to facilitate large additions as needed. The initial construction will consist of a concrete and steel machine shop, 75 x 150 ft., and a power house, 50 x 50 ft. William H. Vogel is president; Jesse W. Otto is vice-president, and Louis E. Vogel, secretary and treasurer.

The Milwaukee Motorcycle Company, 834-836 Muskego avenue, Milwaukee, has increased its capital stock from \$12,000 to \$50,000, preparatory to beginning the manufacture of motorcycle trucks of 600-lb. capacity. Some new equipment will be required now, but the bulk of the purchases will be made next spring.

The White Construction Company, Milwaukee, steel and concrete contractor, has increased its capital stock from \$3000 to \$100,000 and proposes to greatly extend its activities.

The Mutual Brewing Company, 230 Grand avenue, Milwaukee, has awarded the general contract for the construction and equipment of the proposed new co-operative brewery at Thirty-fifth and National avenues to the William Griesler Company, of St. Louis, Mo. The plant will cost \$315,000. Edward Hundt is president and P. H. Nolan is general manager and secretary.

The Rosenthal Corn Husker Company, West Allis, Wis., is planning a large addition to its farm machinery works. Foundations will be laid at once.

The Harris Typewriter Company, Fond du Lac, Wis., will, on January 1, increase its production to 25 machines per day and increase its payroll from 175 to 250 men as the result of a large order from Sears, Roebuck & Co., Chicago. No additions will be constructed, but considerable new special equipment and tools will be purchased. Fred J. Rueping is president.

The Falls Stanchion Company, manufacturer of farm equipment, Sheboygan Falls, Wis., will erect a two-story factory building, 45 x 70 ft.

The Phoenix Mfg. Company, Eau Claire, Wis., manufacturer of sawmill and woodworking machinery, log-hauling machines and tractors, is experiencing the busiest winter in years and is daily shipping machinery to all parts of the country. In addition the company is perfecting a new semi-automatic lathe, designed by C. Conradsen, the inventor of the turret lathe. Mr. Conradsen is now at Fond du Lac, where a firm is manufacturing his 6-spindle chucking machine, and on his return to Eau Claire the new lathe will be placed on the market.

The Janesville Electric Company, Janesville, Wis., has appropriated \$7500 for new generating equipment in the Monterey, Indian Ford and Fulton power stations.

The Laursen Pump Company, automatic pumping machinery manufacturer, Eau Claire, is erecting a new assembling and testing shop.

The Northwestern Motor Company, Eau Claire, has been organized by Kim, T. W. and R. R. Rosholt to manufacture internal combustion engines for automobile and tractor purposes. The new company has a capital stock of \$25,000.

The Wisconsin Stable Equipment Company, Oconomowoc, Wis., recently incorporated with \$50,000 capital, has taken over the plant and business of F. W. Moldenhauer & Son, and will enlarge the production lines to comprise pump and power machinery for farm use. The Moldenhauer foundry and machine shops will be greatly enlarged early next year.

The Janesville Sand & Gravel Company, Janesville, Wis., one of the largest operators in its line in the Middle West, is planning to install its own power plant, which will require a 250-hp. steam engine direct connected to an alternating generator, and 20 motors for individual drive of machines and hoists. At present current is received from the Janesville Electric Company.

The Eureka Cooperage Company, Menasha, Wis., has started work on a factory group. Until now the company has been operating in part of the Onward Glass Company's works. The company manufactures slack and tight barrels and will need woodworking machinery.

The A. E. White Machine Works, Eau Claire, Wis., has been incorporated with a capital stock of \$25,000 by Albert E. and William A. White, to manufacture saw mill machinery, specializing in saw swages and sawe shapers.

The Gund Mfg. Company, La Crosse, Wis., has been incorporated with a \$40,000 capital stock to manufacture anchors by Henry Gund, H. H. Long and C. R. Pepper.

Cincinnati

CINCINNATI, OHIO, December 1, 1913.

Quite a number of machine tools were ordered by the technical school in Chicago mentioned previously, and local machine tool builders received a fair share of the business. The Pullman Company also bought several tools in this market for its shops at Pullman, Ill. The export trade is only fair, but the past week's record is probably an improvement over the previous one, as the buyer for a large European machinery firm spent several days here recently, and it is understood that he left a number of orders for different kinds of machine tools. The ice machinery business is fairly good, and both of the local manufacturers are busy. Electrical equipment is moving slowly, but a number of large prospects in the South may soon turn into purchasers.

McWilliams & Schulte, Cincinnati box manufacturers, have employed an architect for an extensive addition to their plant on Court street.

The Swing & Bickett Machine Company, Cincinnati, has changed its name to the Bickett Machine & Mfg. Company. No immediate additions to its plant are planned.

The plant of the Schacht Motor Car Company, Winton place, Cincinnati, has been acquired by Duhlmeier Brothers. It is currently reported that it will be converted into a furniture factory. No information is available as to machinery requirements, but if the report is correct, considerable woodworking and power transmission equipment will be needed.

The Boss Washing Machine Company, Norwood, Ohio, has tentative plans under way for rebuilding its plant recently destroyed by fire. As was recently mentioned, the company is fitting up a temporary plant in Cincinnati, but it is reported that plans for rebuilding on the same site in Norwood have definitely been decided on.

It is announced that the plant of the Tipp Mfg. Company, Tippecanoe, Ohio, recently destroyed by fire, will be rebuilt at an early date. The company manufactures mechanical toys and will require considerable special equipment.

The Cincinnati, Hamilton & Dayton Railroad Company is having plans prepared for a large roundhouse and coal elevator to be erected at Hamilton, Ohio.

The Crystal Ice Company, Ironton, Ohio, contemplates additions to its plant that will necessitate the purchasing of ice-making machinery.

The Morr Shoe Mfg. Company, Ashland, Ohio, has been incorporated with \$50,000 capital stock to operate a shoe factory. G. M. Morr is the principal incorporator.

The Faultless Rubber Company, Ashland, Ohio,

has preliminary plans in progress for the erection of a manufacturing building at Ashland. F. W. Miller is president.

The West Jefferson Creamery Company, Lazelle street, Columbus, Ohio, will require refrigerating equipment for a large creamery plant to be erected at an early date.

The Indiana Public Service Company, Aurora, Ind., has sold to the Insull Company, Chicago, Ill., the lighting, gas and water plant at Aurora. The new holder will remodel the plant and add considerable new equipment.

Cleveland

CLEVELAND, OHIO, December 2, 1913.

A good demand for some lines of machinery is reported in spite of continued dullness in the standard tool market. A good volume of orders is coming out for the lighter types of handling equipment such as hoists and trolleys and the demand for locomotive cranes is holding up well. Little call is noted for large cranes but some good business is in prospect in coal and ore handling machinery. In machine tools little business is coming out except for single machines, and this mostly in medium and small sizes. Inquiries are pending from Ohio tire manufacturers for two medium sized boring mills. The demand for second-hand machinery is moderately active. Manufacturing plants in metal working lines generally are curtailing their production and few are running at capacity. While a few of the automobile plants in the Central West are running full, these are exceptional as more are running at less than half their normal capacity. The same may be said of plants engaged exclusively in the manufacture of automobile parts.

Bids will be received by the director of public service, Cleveland, until December 10 for a steam turbine-driven exciter set and a distribution switchboard and equipment for the municipal electric light plant.

The Grant Motor Company, Detroit, Mich., has purchased the plant of the Findlay Motor Company, Findlay, Ohio, which failed some time ago, and announces that the plant will be placed in operation at once. The new owner intends to enlarge the plant considerably. It will be used for the manufacture of low priced automobiles.

Bids will be received by H. J. Lawler, county clerk, Lima, Ohio, until December 8 for an electric generating plant, etc.

The Federal Clay Products Company, Mineral City, Ohio, will shortly begin the erection of a plant to replace one that was recently burned.

The Niles Auto & Machine Company, Niles, Ohio, has been organized to repair and build automobiles. H. A. Wilson and R. G. Adams are the owners. The company will occupy the building formerly occupied by the Sykes Lath & Roofing Company.

Bids will be received by W. D. Fisher, clerk of the Board of Public Affairs, Baltic, Ohio, until December 3 for a complete waterworks system.

The Central South

LOUISVILLE, KY., December 1, 1913.

Dull business has been the rule the past week, according to most reports, though in certain lines trade is holding up fairly well. Several large jobs have come in lately and have given the machinery houses encouragement. Manufacturers of special equipment, such as the ice machine men, complain that the banks have shut down in the matter of lending money to finance new enterprises and that for this reason the number of new factories to be erected is extremely small. Consequently an improved financial situation is needed to make business good with them. The demand for electrical equipment is better than for any other kind of machinery. Woodworking machines are selling reasonably well.

The Louisville Water Company, which decided to issue revised specifications for proposals on the installation of two 400-hp. water-tube boilers, has announced that bids will be opened Tuesday, December 16. Theodore Leisen is chief engineer of the company.

The Louisville Gas & Electric Company, which, as reported in last week's issue of *The Iron Age*, is in the market for two 5000-kw. turbines for an extension of its power plant, will require also eight 500-hp. boilers as well as the usual auxiliary equipment. G. Wilbur Hubley is chief engineer.

The Casey-Hodges Company, Chattanooga, Tenn., has installed a battery of boilers with a capacity of ap-

proximately 600-hp. in the flooring factory of the Wood Mosaic Company, New Albany, Ind., a local suburb.

Franchises for an electric light plant and water-works have been offered at Whitesburg, Ky., and it is stated that companies to operate the plants are now being formed. The mayor can give details.

Bromley, Ky., has voted to issue bonds of \$4000 for the purpose of improving the water system.

Taylorville, Ky., has decided to establish a water system and has commissioned Rowland Cox, Taylorville, to draw plans. The amount available is \$9000.

Machinery men are interested in the fact that tobacco stemmies are now using machines for this work instead of having it done by hand. The W. L. Petty Company, Lexington, Ky., has just installed a machine stemmer, and other plants are expected to follow its example.

The Erie Basket Company, Hickman, Ky., is preparing to install turning lathes for the manufacture of handles. It will also buy lathes for making veneers to be used in the manufacture of berry baskets, etc.

The Lone Knob Tobacco Company, Junction City, Ky., has established a factory and will add to the equipment in the near future. W. A. Reynolds may be addressed.

The West Kentucky Petroleum Company, Dukehurst, Ky., has been formed with \$60,000 capital stock and will drill for oil in the Ohio County field. I. P. Barnard and F. M. Sackett, Louisville, are interested in the company, which will purchase rigs and other equipment at once.

Marvin Katterjohn has purchased a controlling interest in the plant of the Anderson Box & Basket Company, Henderson, Ky., and will enlarge its operations.

The Kentucky Redrying Company, Lexington, Ky., has been established for the purpose of erecting a large drying plant for tobacco. Boilers and other equipment will be needed. J. H. Cunningham is president.

The factory and warehouse of the W. D. Lancaster Loose Leaf Tobacco Warehouse Company, Owensboro, Ky., were destroyed last week with \$25,000 loss. Plans for rebuilding are now being considered.

The Kentucky Block Coal Company, Hazard, Ky., has completed plans for opening a mine three miles south of Hazard and will purchase the necessary power and mining equipment at once. J. B. Allen is manager. A capacity of 800 tons a day is to be provided for.

A limestone crushing plant, which will grind stone for fertilizer, is to be established at Elizabethtown, Ky., by Harry Stewart, H. O. Williams and others. The plant will probably be electrically operated.

The Weyman-Bruton Company, snuff manufacturer, has purchased a site at Paducah, Ky., for use, it is reported, in connection with the erection of a factory. O. C. Hank is manager of the company's business at Paducah. The main offices are in Louisville.

It is reported that the Campbellsville Public Utilities Company, Campbellsville, Ky., plans to establish a water system as well as an electric light and ice plant. T. M. Estes, Lebanon, Ky., is an officer of the company.

Maysville, Ky., has offered to make a contract with an electric light company for the operation of a street lighting system to cost \$10,000 a year, and a company is now being formed to establish a plant. J. Wesley Lee is mayor.

Frank Conn, Lancaster, Ky., will shortly occupy a building which is now being erected for use as an automobile garage. Machine tools for a repair shop will be purchased.

The McNaughton Grate Bar Company, Maryville, Tenn., will double the capacity of its plant. It will enlarge its foundry and machine shop and purchase a considerable amount of new equipment.

The Sip Bottling Corporation, Memphis, Tenn., is reported to have plans for the establishment of an ice and cold storage plant in connection with a bottling factory at Columbia, Tenn.

J. P. Parker, Ooltewah, Tenn., has plans for the establishment of a knitting mill. The knitting machine will be motor driven, it is stated.

A. E. Ausman, Chattanooga, Tenn., will establish an automobile factory or assembling plant, it is stated, and will need machine tools and other equipment.

The Nashville Veneer Company, Nashville, Tenn., has been incorporated by A. B. Ransom, W. B. Drinkard and others and will establish a veneer mill. Power machinery and special equipment will be bought.

The Lutz Chair Company, Lenoir, N. C., has purchased the plant of the Greeneville Chair Company, Greeneville, Tenn., and will remove its equipment to that point, enlarging the purchased plant considerably.

J. R. Davies, Waukegan, Ill., plans to establish a plant for the manufacture of carwheels, molding machines, etc., at Nashville, Tenn.

Birmingham

BIRMINGHAM, ALA., December 1, 1913.

Machinery dealers report a satisfactory demand for gasoline engines and small pumps, but that otherwise trade is characterized by the conservatism shown for some time. Such machinery and implements as are used on farms and handled by country merchants are good sellers. The coal mines have taken on greater activity and several new mining enterprises have called for pumps and engines. Dealers are still cheerful, declaring that fundamental conditions are good and that trade will pick up early in the new year at the latest.

The Canadian Marble Company, Birmingham, Ala., has been incorporated by George E. Harrison, F. G. Fonville and others, with a capital stock of \$12,000, and plans to quarry marble near Sylacauga, Ala.

The Patterson-Edey Lumber Company, Mobile, Ala., has been incorporated by W. B. Patterson, John E. Patterson, Aubrey Edey and R. H. Smith, to engage in the sawmill business.

The West Coal Mining Company, Birmingham, Ala., has completed its organization by electing Walter Moore, president, A. B. Mitchell, secretary and W. C. Hamilton, treasurer. The company will develop 300 acres and expects to have a daily output of 1000 tons by March 1.

The Kingsland Clay Products Company, Kingsland, Ga., will establish a clayworking plant to manufacture pressed brick, tile and pipe. J. Q. Dickerson, of Jacksonville, Fla., and others are interested.

Marshallville, Ga., has voted a \$15,000 issue of bonds for waterworks.

The West Bay Naval Stores & Lumber Company will establish a lumber plant at St. Andrews, Fla., in place of the one recently burned.

The Rotary Machine Company, Tampa, Fla., has been incorporated with a capital stock of \$50,000 by Harry T. Roan, E. G. Erwin and W. H. Knight. The company will manufacture a ship's hull cleaner.

The Automatic Gas Company, Jacksonville, Fla., has been incorporated by V. C. Severance, C. H. Childs, Thomas B. Adams and others, with a capital stock of \$100,000, to manufacture individual gas-generating plants for homes, business houses, etc.

St. Louis

ST. LOUIS, MO., December 1, 1913.

The machine tool market has been sluggish. In a general way there is a feeling that no decided change will come until currency and railroad rate matters are settled and capital feels less timid. At the same time there is quite a steady but small flow of replacement business, etc., but really new installations or extensions are few. Collections are reported fair.

The Universal Cutter Company, St. Louis, recently incorporated by J. B. Gury and others, has contracted for the construction of a building for its plant which will manufacture electric devices for cutting cloth.

The Polar Wave Ice & Fuel Company, St. Louis, has contracted for an ice storage building, which it will also equip with refrigerating and ice-making machinery, for which latter it is now in the market. C. W. Whitelaw is president.

The Hamilton Brown Shoe Company, St. Louis, has begun the construction of a factory building at Union, Mo., which will be equipped with power and operating machinery to cost about \$100,000.

The Murphy Door Bed Company, St. Louis, has increased its capital from \$10,000 to \$20,000 for the purpose of increasing its equipment.

The Bintliff Supply Company, St. Louis, has been incorporated with a capital stock of \$10,000 by Harry B. Bintliff, James H. Thompson and Edwin G. Busmann to manufacture railroad and mill supplies.

The Mechanical Mfg. Company, St. Louis, has been incorporated with a capital stock of \$15,000 by Isadore Wagner, John J. Meier and Joseph Van Raalte to engage in general manufacturing.

The Envelope Mfg. Company, St. Louis, has increased its capital stock from \$15,000 to \$50,000 for the purpose of extending its output.

The St. Louis Bank Equipment Company, St. Louis, has been incorporated with a capital stock of \$25,000 by William L. Punskey, Louis Brohammer, Joseph B. Gander and others to manufacture furniture, office equipment, etc.

The St. Clair Mining & Milling Company, St. Louis, has been incorporated with a capital stock of \$1,250,000 by J. H. Bartle, of St. Clair, Mo.; C. T. Dana, L. M.

Finley and Roy S. Rauschkolb, of Webster Groves; J. E. Gathright, East St. Louis, Ill., and L. B. McGinnis to take over existing plants and property in southeast Missouri, add equipment and extend mining operations.

The Crescent Concrete Mold Company, St. Louis, has been incorporated with a capital stock of \$16,000 by John H. Bruninga, Thomas E. Vaughan and A. C. Stewart to manufacture molds for manufacturing concrete blocks, etc.

The Retzbach Ice Cream Bricking Machine, St. Louis, has been incorporated with a capital stock of \$10,000 by Edward J. Retzbach, Clemens A. Dierkes and L. C. Retzbach to manufacture machinery for making ice cream, etc.

The Black Hawk Broom Company, St. Louis, has been incorporated with a capital stock of \$16,000 by Solomon Kaplan, Edward B. Meidner and Sam I. Siff to manufacture brooms.

The Muehlebach Estate, of Kansas City, Mo., have plans for the immediate construction of a \$1,000,000 hotel building with independent power, lighting, ventilating and heating equipment. Baird & Huselton are in charge.

Bids will be received by Henrici, Kemp & Lowry, Kansas City, Mo., engineers, until December 10 for waterworks for Hopkins, Mo.

The Butler Mfg. Company, Kansas City, Mo., will considerably extend its plant for the manufacture of steel tanks, erecting a new building and adding new machinery.

The town of Sweet Springs, Mo., under the direction of the town clerk, is in the market for a generator and engines for an electric light plant of about 75 kw. capacity.

The Salem Light & Power Company, Salem, Mo., will add to its equipment a generator and an engine of about 50 kw. capacity.

The American Mfg. & Therapeutic Supply Company, Kirkeville, Mo., has been incorporated with a capital stock of \$12,000 by George Still, E. C. Brott and others to manufacture medical appliances, etc.

The Western Bridge Company, Harrisonville, Mo., has been incorporated with a capital stock of \$10,000 by George and Allen W. Bird to equip an iron works plant.

The city of Cape Girardeau, Mo., has ratified a franchise by which the Missouri Utilities Company, St. Louis, will expend \$100,000 in enlarging and improving the water and electric plants of Cape Girardeau.

The Excellor Feed Milling Company, St. Joseph, Mo., has increased its capital from \$75,000 to \$100,000 for the purpose of extending its mechanical equipment.

The city of Prairie Grove, Ark., has organized an improvement district and will issue bonds to the amount of \$50,000 for the construction and equipment of an electric light plant and waterworks.

The grist and sawmill of James Moorhead at Sanders, Ark., destroyed by fire, will be rebuilt at a cost of about \$10,000.

The Southwest Silo Company, Oklahoma City, Okla., is reported in the market for pipe threading machinery, welding equipment, power press and squaring shears.

The Idabel Cotton Oil Company, Idabel, Okla., recently organized to operate a textile plant, will also equip a plant for the manufacture of cotton oil.

The American Rail Joint Company, Oklahoma City, Okla., has been incorporated with a capital stock of \$50,000 by W. F. Baker and A. J. and T. J. McMahan to manufacture a patented rail joint.

L. E. Miller, of Oklahoma City, Okla., is organizing a company which will equip a plant for the manufacture of machinery to clean and delint cotton seed.

The Succor Rod Pulling Machine Company, of Tulsa, Okla., has been incorporated with a capital stock of \$10,000 by W. B. Bryan, J. B. Dunlap and Peter Deichman to manufacture pulling machines.

The Castona Improved Process Company, Laine, Miss., will establish plants in various parts of the South for the manufacture of turpentine, pine oil, rosin and paper pulp from resinous woods, using sawmill waste. The equipment to be required for the plant to be established at Laine includes two 100-hp. boilers, a 75-hp. engine, chippers, shredders, distilling apparatus, pumping machinery, etc. The cost of the proposed plant will be \$40,000. J. H. Castona is president and manager of the plant.

The city of Summer, Miss., will expend about \$15,000 at once on waterworks equipment, it is stated, and is in the market for the necessary machinery. A. L. Whitton is clerk.

The city of Crowley, La., will install a 300-hp. engine and a 200-kw. generator at a cost of about \$20,000.

E. S. Cranie, Homer, La., is reported in the market for machinery for a cotton mill which he anticipates establishing.

The Vicksburg, Shreveport & Pacific Railway will enlarge its shops at Monroe, La., and add equipment to cost about \$50,000. D. D. Curran, New Orleans, general manager, is in charge.

The Pan-American Distilling Company, New Orleans, La., has been incorporated with a capital stock of \$50,000 by Charles Levy, Henry Hirsch and others and will equip a distilling plant at once.

Bids will be received by F. S. Shields, secretary of the sewage and water board, New Orleans, La., until January 6 for pumps and other water supplies.

Texas

AUSTIN, TEXAS, November 29, 1913.

Quietness continues to feature conditions. Activity in municipal enterprises has helped to improve business slightly, but any marked changes in the outlook are lacking. There is still hope that decided improvement will be evident before the end of the year. Heavy rains have caused disastrous floods in some sections of the State, particularly in the northwest, where power and irrigation projects have been halted by high water.

The Bishop Ice & Cotton Company, Bishop, has let the contract to the Southern Construction Mill & Supply Company, Houston, for the erection of a mill and elevator. The plant, which will cost about \$12,000, will have a storage capacity of 20,000 bushels of grain, and a milling capacity of 250 bushels an hour. M. Nickols is manager of the Bishop Ice & Cotton Company.

With the issuance of \$2,000,000 of bonds by the Union Terminal Company, Dallas, it is announced that the work of razing buildings now occupying the site of the proposed union depot at Dallas will begin shortly. The actual work of construction is expected to be started within 90 days. The structure will cost about \$3,000,000, not including the approaches to be constructed by some of the railroads in reaching the station and terminal improvements to be made.

The Meier-Miller Cotton Harvesting Machinery Company, Dallas, has been incorporated with a capital stock of \$25,000 by John Meier, T. S. Miller, Jr., and S. A. Stemmens.

The taxpayers of Georgetown have voted a \$13,500 issue of bonds to sink an artesian well and enlarge and improve the waterworks plant and system.

Steps are being taken to reorganize the Brenham Furniture Company and install new and improved machinery in its plant at Brenham which has been idle for several years.

With the completion of the Texico-Coleman cutoff of the Santa Fe system in western Texas, it is announced that additional roundhouse and divisional point facilities will immediately be constructed at Slaton.

The Mesa Egyptian Cotton Growers' Exchange, Mesa, Ariz., has completed plans for the erection of a cotton seed oil mill, with a capacity of 700 tons of seed, to cost about \$10,000.

The Pacific Northwest

SEATTLE, WASH., November 28, 1913.

The machine tool trade remains quiet, and little general machine business of importance is under way. During the last few weeks many mills and camps have closed for the winter, and orders for overhauling and repairs are now beginning to come out. While there is not so much tendency toward expansion as seemed likely a few months ago, the number of improved devices lately introduced for the handling of logs and lumber, power generation and transmission, etc., result in a very fair amount of inquiry from the older plants. The outlook for general business in the interior is good, as the principal agricultural districts of Washington, Oregon and Idaho are prosperous.

It is announced that the Chicago, Milwaukee & St. Paul Railroad will soon let contracts for electrifying 113 miles of its Puget Sound extension.

Plans are under way for the first unit of the Lake Union steam-electric plant for the city of Seattle.

The Puget Sound & Queen City Boiler Works, Seattle, has changed its name to the Puget Sound Boiler Works.

I. S. Harding, 1507 Harvard avenue, Seattle, has completed plans for the erection on Western and Bell streets of a three-story and basement laundry building. The structure is estimated to cost \$25,000.

The Utility Mfg. Company, Seattle, Wash., has been

organized by Allan S. Kirk, P. S. Eves, of Portland, and W. S. Eason, of Seattle, with a capital stock of \$300,000. The company will erect a factory in Seattle for the manufacture of household utilities.

The Vulcan Iron Works, Seattle, has been taken over by Fred Furth, who has been connected with the business, and M. Zan, formerly sales manager for the Meese & Gottfried Company, of San Francisco.

The C. D. Danaher Lumber Company's mill near Tacoma, Wash., will be closed December 15 for repair work amounting to \$10,000.

A large foundry will be erected by the Pacific Iron & Steel Company, Tacoma, Wash., on a site recently purchased from the city. Plans are practically completed.

George H. Gray & Son, Entiat, Wash., are having plans prepared for the establishment of logging camps on the Entiat River in central Washington, where they plan to log some 1,500,000 ft. this winter. The capacity of the mill at Entiat will also be largely increased, and a box factory will be built to supply the increasing demands of fruit growers.

J. L. Andall, Bellingham, Wash., is planning to build a large shingle mill near South Bend, Wash.

Ingalls Bros., Cathlamet, Wash., will erect a power plant to generate power for the city of Cathlamet. Franchise covering a period of 25 years has been granted them, and the system will be in operation within six months.

The Empire Lumber Company, Victoria, B. C., will construct a sawmill at Osborne Bay, near Crofton, B. C., with a daily capacity of 250,000 ft. C. C. Young, of New York City, is president of the company.

The No. 8 mine of the Canadian Collieries, owned by McKenzie & Mann, Cumberland, B. C., recently sustained a loss of \$100,000 from fire. It will be repaired at once, with the installation of considerable new machinery.

C. L. Houston, Astoria, Ore., has received the contract for the construction of a \$60,000 mill and elevator for the Astoria Flouring Mills Company. The elevator will have a capacity of 100,000 bu. of grain.

Major McIndoe, in charge of Columbia River improvements, has forwarded to Washington a recommendation for the installation of new 30-in. suction pipes and pumps on the dredge Chinook, at an estimated cost of about \$100,000. The dredge is undergoing repairs at a cost of \$10,000.

The machine shop of the Booth-Kelly Lumber Company, Wendling, Ore., was destroyed by fire November 20, with an estimated loss of \$15,000.

The Northwest Steel Company, Portland, has completed plans for its plant to be built in South Portland. The main building will be two stories, with a floor space of 57,000 sq. ft., to house the forge and machine shops, etc. The structural shop will be 59 x 580 ft.

C. W. Bahrke is installing a furniture and box factory at Lebanon, Ore.

A plan for enlarging the system of the Water Users Association, Pocatello, Idaho, was formulated at a recent meeting of that body with Mr. Wymouth, chief engineer, and Mr. Henry, consulting engineer of the United States Reclamation Service. A resolution was passed providing for an increase of 20 per cent. in pumping capacity, the proposed improvements to cost \$120,000.

The B. C. Potter Company, Victoria, B. C., will at once rebuild its factory building, recently destroyed by fire. W. Carkeek & Co., Seattle, Wash., are the contractors, and the Geysbeek Engineering Company the architect. The building will be three stories and will cost \$20,000.

Canada

TORONTO, ONT., November 29, 1913.

The Grobb Mfg. Company, London, Ont., which has taken over the London Foundry, will erect and equip an addition to the plant. The company will manufacture vehicle forgings, hardware specialties, etc., but its most important production will be a hydro-carbon gas producer for operating gas engines cheaply. E. Grobb states that it cost nearly \$300,000 to perfect the producer. The company has already an order for \$92,000 worth of its manufactures from a company which may possibly locate in the same city.

The No Draught Ventilator Company, Windsor, Ont., will erect a five-story and basement factory, 54 x 145 ft. Bids are being received by G. Jacques & Co., architects, 5 Sandwich street, West Windsor.

The McNaughton-McKay Electric Company, Ltd.,

Windsor, Ont., has been incorporated with a capital stock of \$40,000 by A. McKay, J. R. McNaughton and others to manufacture and install electric apparatus, etc.

The International Specialties, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by L. N. F. Cypihot, L. A. Cyr and others to manufacture photographic instruments, surgical instruments, etc.

The Verity Plow Company's plant at Brantford, Ont., will be enlarged in the near future. The company plans to manufacture Massey-Harris harrows.

Adam Beck is contemplating the erection of a box factory at Iroquois Falls, Ont.

The Nova Scotia Car Works, Ltd., Halifax, N. S., is overhauling its plant and rebuilding the foundry destroyed by fire last summer.

Specifications for the new filtration plant at Toronto, which is to be constructed at a cost of \$1,000,000, have been submitted to the board of control by the works commissioner. Bids will be received until January 20, and it is proposed that the first half of the plant shall be completed by the end of 1914. The plant is to have a capacity of 60,000,000 gals. a day.

Walker & Clegg's furniture factory at Wingham, Ont., has been destroyed by fire with a loss estimated at about \$10,000. Work on a new brick factory will be started as soon as possible.

A syndicate composed of A. L. McPherson and others has secured the plant of the Farmers' Binder Twine Company, Brantford, Ont. The plant will be immediately occupied by the Brantford Scale Company and the Grey Iron Company, recently organized.

A plant is to be built at Kingston, Ont., by the Kingston Iron & Tubing Company, to cost about \$75,000.

The Dominion Power & Transmission Company has plans in preparation for a steam power plant to be erected at Hamilton, Ont. Installation will be made of two units of 10,000 hp each with space provided for installation later of two additional units of the same rating.

The Alberta Hydro-Electric Company, Ltd., Calgary, Alberta, has been incorporated with a capital stock of \$1,000,000 by F. S. Albright, Arthur L. Smith and others.

It is announced that the Westinghouse Company, Ltd., of England, Scotland and Canada, will erect a plant at North Burnaby, B. C. The company has acquired a site.

The Canada Cement Company, Dauntless, Alberta, will expend \$400,000 on gas and water plants.

Fire damaged the plant of the Hatson & Gillies Electrical Company, Vancouver, B. C., to the extent of \$150,000.

The foundation walls of a large power house at Winnipeg for the Provincial Government are being built. The building, which is being erected at a cost of about \$160,000, will cover 11,400 sq. ft.

A by-law was passed at Oak Bay, B. C., to grant \$50,000 for waterworks.

The Regina Legislature has passed an act which abolishes the system of bonusing industries in Saskatchewan.

Government Purchases

WASHINGTON, D. C., November 27, 1913.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until December 16, schedule 6076, for one electrically-driven engraving machine, one universal milling machine, one universal tool-grinding machine for Brooklyn; schedule 6075, for one combined slitting and bench shears for Brooklyn.

Until December 23, schedule 6067, for one machine for recutting valves and discs for Puget Sound.

Until December 30, schedule 6081, for electric furnaces, etc., for Puget Sound; schedule 6082, for two pipe-bending machines for Puget Sound.

Bids will be received by the paymaster-general of the navy until December 16 for furnishing the following:

Schedule 6044—Steam Engineering
Class 43, Mare Island—One fuel-oil heater and one spare coil.
Class 43, Alternate—F.o.b. works.

Bids will be received at the office of the lighthouse inspector, Boston, Mass., until December 17, for one four-drum steam hoister for the tender Mayflower.

Bids will be received at the office of the United States Engineer Office, Galveston, Texas, until December 27, for constructing the steel seagoing hydraulic hopper dredge Comstock. Address Charles Riche, lieutenant-colonel engineers.

Trade Publications

Open-Hearth Sheets.—Apollo Steel Company, Apollo, Pa. Booklet. Devoted to the Apollo brand of Bessemer black and galvanized steel sheets. Full information regarding the sizes and gauges of the sheets made is included.

Oil and Gasoline Storage Outfits.—Tokheim Mfg. Company, Cedar Rapids, Iowa. Collection of bulletins. Relate to a line of oil and gasoline storage and pumping outfits and apparatus for garages, factories, etc. The tanks are constructed of galvanized tank steel and are fitted with a fill pipe designed to prevent explosion. The parts of one of the self-measuring pumps mentioned are constructed to admit of especially quick access for repair. A gallon meter is furnished as part of the equipment. An installation of pumps on several floors of a factory with storage tanks under ground is illustrated. Battery outfits for lubricating and other oils in combination designed for factories and large garages are featured. Among this special equipment mentioned is a gasoline filter, hose, nozzles, etc. Attention is called to the Underwriters' label, placed on the company's products.

Steam Turbines and Generators.—Allis-Chalmers Mfg. Company, Milwaukee, Wis. Bulletin 1084, superseding bulletin 1079. Illustrates and describes the standard horizontal Parsons or reaction type of Allis-Chalmers turbo-generating sets, built in sizes from 300 kw. up. The turbines are furnished in the high-pressure condensing, the high-pressure non-condensing and low or mixed pressure condensing styles. Among the advantages claimed for the company's system of blading is that the blades are firmly attached and that the spacing and angles of the blades are accurate and that each blade is individually formed by special machine tools. Attention is called to the ventilating provision made for the generator and the unusually low power required for the excitation of the alternating current turbo-generator. Among several installations illustrated, one is at the Cambria Steel Company, Johnstown, Pa.

Punching and Shearing Machine.—Clark Foundry Company, Rumford, Maine. Folder. Relates to the company's No. 2 power machine, which is fitted with a removable and interchangeable punch and die holder or yoke. It is claimed that but 10 sec. is required to change form one size or shape of punch to another. The angle trimming attachment takes the regular yoke seat, and is used for trimming angles after they have been cut square on the angle cutter and for shearing and trimming plates up to $\frac{1}{2}$ in. thick. The company's hand machine is also illustrated. A partial list of purchasers is included.

Vertical Boring Mills.—Gisholt Machine Company, Madison, Wis. Illustrated circular. Relates to the use of vertical boring mills in electrical plants and locomotive shops. Views are given of these machines in use; one view showing a battery of four 42-in. mills finishing motor housings and bonnets, where an accuracy of 0.001 in. is required. Two views are given of 52-in. mills in railroad shops, one boring a tire and the other a journal. Mention is also made of the boring of air pump cylinders with this machine where the time required has been reduced from 95 to 16 min.

Ball Bearings.—Hess-Bright Mfg. Company, Philadelphia, Pa. Pamphlet. Contains a brief discussion concerning ball bearings and their application to axle generators for train lighting with particular reference to this company's product. The construction of the bearings is briefly described and there are a number of the views showing them applied to the armatures on train lighting generators.

Iron Cement.—Smooth-On Mfg. Company, 572 Communipaw avenue, Jersey City, N. J. Folder. Shows a few of the ways in which the company's iron cement No. 7 has been used for waterproofing and stopping leaks in concrete. These include repairs to cellar sidewalls, cracks in concrete oil storage tanks, etc.

Elevating Trucks.—Cowan Truck Company, Holyoke, Mass. Catalogue. Shows these trucks in use in a number of industrial plants for handling a wide variety of material and includes a number of testimonial letters. The different types of trucks are also illustrated and condensed specification tables are given. An illustration of the various replacement parts, numbered to correspond with a list for ready reference is given, together with data on the reduction in cost made possible by the use of these trucks.

Clam Shell and Orange Peel Buckets.—McMyler-Interstate Company, Cleveland, Ohio. Bulletin No. 29. Describes and illustrates a line of clam shell and orange peel buckets, including different types of two, three and four line clam shell buckets and extra heavy standard multi-power, rope reeved and three-sided orange peel buckets, with tables of sizes and dimensions. Standard gauge locomotive cranes equipped with the company's bucket for handling sand, gravel, coal and ore are shown, as well as other types of locomotive cranes. A steam clam shell bucket, which can also be operated by compressed air and various types of material handling tubs are also covered.

Air Compressors.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 34-D. Illustrates and describes a line of steam-driven Corliss air compressors for use where large volumes of compressed air are required. The advantages of using one

or more large machines instead of a number of smaller units are pointed out, and this is followed by a complete description of the construction and mechanical details of the compressors, the text being supplemented by numerous line and halftone engravings. Tables of dimensions are given, together with views of the compressors in use in a number of plants. Views are also given of the various other types built by this company.

Concrete Machinery.—Bragstad Concrete Machinery Company, Canton, S. Dak. Treats of machinery for making reinforced concrete blocks and shows a number of structures that have been erected with this type of building material. The advantage claimed for the use of reinforced concrete blocks is that the cracks that frequently have been found in concrete structures are eliminated.

Crucible Steel.—Braeburn Steel Company, Braeburn, Pa. Cloth bound catalogue. Size, $5\frac{1}{4} \times 7\frac{3}{4}$ in.; 57 pages. Illustrates a large line of crucible carbon steel castings and forgings. Attention is called to the several standard grades of crucible alloy steels for special uses and to annealed steel. Directions for using the various grades to best advantage are given. Several pages of generally useful rules and tables are included in the booklet.

Heat Treatment.—Peerless Motor Car Company, Cleveland, Ohio. Illustrated booklet. Size, $4\frac{1}{4} \times 6\frac{1}{4}$ in.; 14 pages. Relates to the special heat treatment and metallurgical attention given the steel entering into the construction of the company's motor cars. Not only is all the steel analyzed as received, but research work is constantly under way. It is claimed that in scope and accomplishment the work along heat treatment lines excels the laboratories of any steel mill or university. The necessity for special treatment to obtain steels adapted for various uses is discussed. The company finds it necessary to use as many as four separate heat treatments for one piece of steel. Laboratories and processes of heat treatment are well illustrated.

Steam Apparatus.—Consolidated Mfg. & Supply Company, 610 Manufacturers Building, Pittsburgh, Pa. Pamphlet and Engineer's bulletin, No. 120. The double valve of the steam trap illustrated in the pamphlet is claimed to afford a greatly increased capacity over other types. The trap has but four working parts. Among other features, attention is called to the installation of this trap above the water line, thus making for accessibility and freedom from mud and scale. Cross-sections and the method of installation are shown. The steam separator illustrated in bulletin No. 120 is of steel shell construction and is furnished in both vertical and horizontal types, and made for any capacity or pressure desired. The construction of the baffle is claimed to be such that the pressure reduction is a minimum, and that all the foreign material is separated from the live steam. Horizontal and vertical receiver separators, oil separators and a whistle alarm discharge tank are illustrated. A list of separator users and results of tests are included.

Grab Bucket and Converter.—Whiting Foundry Equipment Company, Harvey, Ill. Catalogues Nos. 104 and 106. The first describes and illustrates the Watters quick detachable grab bucket, designed for cleaning up foundry floors, cutting and cooling sand, filling large molds, or conveying coal in power stations and other use where crane service is available. A special feature claimed for the grab bucket is that it is instantly detachable from the crane. Among the advantages mentioned, emphasis is placed upon the fact that the blades can be readily released from any position, even if an obstruction should be placed between them. Directions for operation and photographs of typical installations are given. The side-blow steel converter treated in catalogue No. 106 is furnished in 1 and 2-ton sizes. Much general steel process information is given as well as a plan and list of equipment necessary for a complete plant. Whiting converter installations, such as at the Oliver Chilled Plow Company, South Bend, Ind., are illustrated.

Turbine Pumps.—Platt Iron Works Company, Dayton, Ohio. Bulletin No. 755. Pertains to a line of high lift and turbine pumps for high head, waterworks, boiler feed, mine and similar services. It shows a few standard designs which are built for all heads and service conditions up to 700 ft., and are arranged for direct connection to electric motors, steam turbines, steam or gas engines, or for belt drive, as may be desired. The general construction and principle of operation are briefly touched upon, followed by the results of tests and directions for installing and operating. A table of general dimensions with two sets of elevation drawings is included.

Spiral Riveted Pipe.—American Spiral Pipe Works, P. O. Box 485, Chicago, Ill. Catalogue No. 5, fourth edition. Size, $8 \times 10\frac{1}{4}$ in.; 80 pages. The pipe is made from sheet steel, wound into helical shape, and is cold riveted by compression or squeezing. It is made in a continuous piece and cut off to any length. Hydraulic tests are claimed to prove that the seams are the strongest part of the pipe. Attention is called to a special forged steel flange claimed to obviate the expensive breakage experienced with cast-iron flanges to galvanized pipe for refrigerating plants and other pipe and pipe fittings. A large part of the catalogue is given up to illustrated descriptions of a number of installations. Several pages of generally interesting information, including tables in regard to hydraulics, are given.

THE IRON AGE

Established 1855

New York, December 11, 1913

Vol. 92: No. 24

Removing Sulphur from Molten Cast Iron

A Method of Introducing Compressed Air into the Metal in the Ladle — A Treatment of Hard Iron Which Results in Soft Castings

A patent has been granted to W. F. Prince, foundry superintendent, the Henry R. Worthington Company, Harrison, N. J., on a process for removing sulphur from molten cast iron. It is both novel and simple and also metallurgically interesting. The patentee claims to be able to reduce the sulphur content by 30 to 50 per cent. and has accomplished this in numerous instances. Sulphur is the *bête noire* of the iron foundryman. Any process by which the content can be kept down has special commercial and metallurgical value. Many castings have been lost because of the presence of defective spots of various sizes, attributed in many cases to kish, sand, or oxide.

It occurred to Mr. Prince to have some of these spots analyzed. He found them almost invariably high in sulphur, as also in manganese and silicon, while the normal iron of that part of the casting was lower in sulphur and manganese than the average for the casting. If the original surrounding normal iron contained silicon, 2.50 per cent.; sulphur, 0.050 to 0.080 per cent., and manganese, 0.70 to 0.90 per cent., then the composition of these spots was often found to approximate silicon, 3.75 per cent.; sulphur, 0.40 to 0.60 per cent., and manganese 1 to 2 per cent. This was thought to indicate the presence of large amounts of sulphide of manganese, the high percentages of sulphur and manganese being decidedly abnormal and surprising.

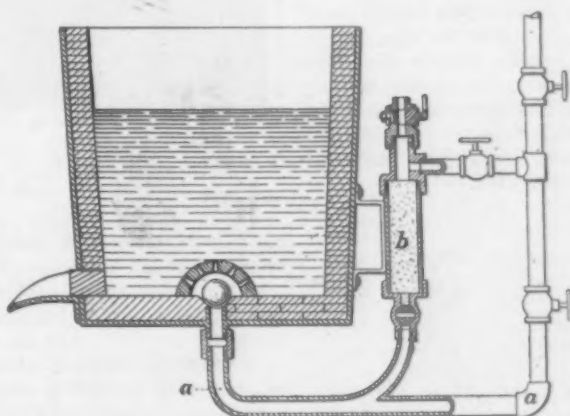
Experiments Leading to the Invention

The next step in the patentee's discovery was an attempt to reproduce, under commercial conditions, this unusual chemical compound or compounds. Success attended these efforts more easily than was at first expected, though Mr. Prince suspected the cause. He believed that these agglomerations of material, high in manganese and sulphur, did not exist in the original iron but that they were formed during pouring and usually in the mold itself. Being thus formed, the agglomerations floated along the walls of the mold until fastened there by the pressure and solidifying of the molten iron. The cause of the formation he ascribed to the ebullition of gas or steam through the iron, set free from the molds or cores by the temperature and pressure of the liquid hot iron, a reaction taking place altogether too often. Acting on these surmises Mr. Prince performed some experiments. He took a ladle holding 1000 lb. and to the bottom, through a small hole, attached a pipe with a hole $\frac{1}{16}$ in. in diameter, connected to an air system of 90 lb. pressure. Into this

ladle the metal was tapped from the cupola. In each experiment at the end of 10 to 20 min. of the gentle ebullition caused by the air a scum or slag was floating on top. Analyses of this slag showed it to be a compound entirely similar in composition to those forming the defects in castings. The results of eight different experiments of this nature are shown in the table on the following page.

These trials were so successful that Mr. Prince experimented with different irons under different conditions with equally satisfactory results; so much so that a large tank was installed, equipped with the same convenient air connections. Castings made from iron thus treated showed a reduction of 25 to 50 per cent. in the sulphur contents and in each case the iron was clean, sound and easily machined. The physical properties also had not been sacrificed. While exhaustive tests have not been made to determine just how much sulphur can be eliminated, it is the opinion of Mr. Prince that it all depends on the amount of manganese present or added. In the hundreds of tests made the results, it is stated, have always been of the same sort. In each case the high sulphur has been lowered decidedly, passing off into the newly formed slag. The original iron has lost some of its manganese, but this can be avoided by adding powdered ferromanganese to the stream of air.

Other alloys, as well as carbon, for increasing the temperature, can be injected also.



Apparatus for Treating Molten Iron with Air to Remove Sulphur

The Apparatus Employed

The apparatus used and patented by Mr. Prince is shown in the illustration. Ordinary compressed air is admitted through the pipe *a* into the bottom of the ladle. The cylinder *b* is used for holding the powdered alloys that it may be desired to inject into the metal with the air. The entire mechanism is attached to the ladle so that the reaction can take place as soon as the metal strikes the ladle and while it is being transported some distance to the molds. The reaction which it is claimed takes place as the "air, gas or steam or other equivalent" comes into contact with the molten metal is that it oxidizes the manganese, creating manganese oxide, which, owing to its affinity, unites with the sulphur to produce a slag which rises to the top of the ladle or reservoir, where it may be skimmed off. During this operation a small quantity of the manganese unites chemically with the sulphur to form manganese sulphide, which rises to the top after it is formed by the agitation produced by the oxidizing agent.

Table of Experiments

Experiment 1			
	Silicon, per cent.	Sulphur, per cent.	Manganese, per cent.
Molten iron	2.55	0.051	0.72
Treated	2.53	0.035	0.52
Slag formed on top.....	3.65	0.429	2.16
Experiment 2			
Molten iron		0.099	0.46
Treated 2½ min.		0.099	0.49
Treated 4½ min.		0.099	0.45
Treated 5½ min.		0.096	0.45
Treated 7½ min.		0.092	0.41
Treated 9½ min.		0.090	0.42
Treated 18 min.		0.065	0.31
Experiment 3			
Molten iron	2.10	0.096	0.42
Treated 2½ min.		0.085	0.39
Experiment 4			
Molten iron		0.095	....
Treated		0.075	....
Experiment 5			
Molten iron	2.25	0.103	0.57
Treated	2.18	0.079	0.42
Treated		0.071	0.36
Slag formed on top.....		0.570	1.12
Experiment 6			
Molten iron		0.074	....
Treated, first part		0.042	....
Treated, last part		0.033	....
Experiment 7			
Molten iron		0.078	....
Treated, first part		0.042	....
Treated, last part		0.033	....
Experiment 8			
Molten iron		0.070	....
Treated		0.056	....

Converting Hard Iron into Soft

The disposition of high sulphur iron with its consequent high combined carbon is always attended with difficulties. In quantities it is practically non-usable for remelting. But Mr. Prince has found some surprising results from an application of his process to such iron. A quantity of high-sulphur borings was melted in the cupola, tapped into an experimental ladle and treated. The iron that was produced was a high grade soft iron having all the properties of a regular foundry iron. The analyses before and after treating were as follows:

	Untreated, per cent.	Treated, per cent.
Silicon	1.02	2.05
Sulphur	0.129	0.089
Phosphorus	0.69	0.66
Manganese	0.36	0.44
Total carbon	2.36	2.43
Graphitic carbon	0.00	2.01
Combined carbon	2.36	0.42

In this experiment the sulphur is reduced 30 per cent. and the carbon has been nearly all changed to graphitic. Both ferrosilicon and ferromanganese were added during treating. It is believed that this opens up great possibilities for it is claimed that not only can such impure iron be reclaimed but that even other irons high in sulphur can be used.

Compared with the Bessemer Process

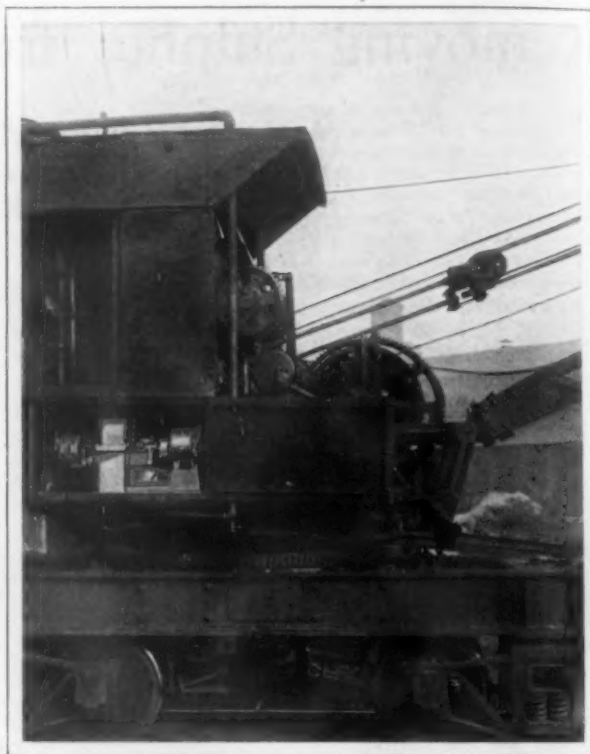
When application was made for the patent, the objection was at first made that it was an infringement of the Bessemer process. In the latter, however, the temperature increases greatly, due to the oxidation of the carbon and the silicon by the air blast; in the new process there is a gradual decrease in the temperature of the molten metal, inasmuch as there is no oxidation of the carbon or silicon, or practically none.

It is claimed that the method can be used in connection with blast furnace work, making pig iron in the usual way, drawing it into a receiver or ladle, treating it as above described and then casting it into pigs, and that it is capable of use in all iron or steel foundries. It has been found of great advantage by the patentee in making large cylinders and pipe and heavy machine castings, increasing the factor of safety by preventing the formation of kish, etc., in the mold.

Locomotive Crane with Lifting Magnet

How a Self-Contained Unit Was Obtained by Including a Steam Turbo-Generator Set

With the view to eliminating the necessity for dragging power wires along the track on which travels a locomotive crane equipped with lifting magnets, experiments have been made in the fitting of such cranes with small electric generating sets driven by steam turbines. One of the most recent applications is the use of a 5-kw. turbo-generator set, built by the Terry Steam Turbine Company, Hartford, Conn., to a 15-ton locomotive crane built by the Brown Hoisting Machinery Company, Cleveland, Ohio. The magnet, energized by the current from this unit, is used



A 15-Ton Locomotive Crane Equipped with a Turbo-Generator Set for Energizing the Magnet Employed for Handling Pig Iron and Scrap

for handling pig iron and scrap at any point within the reach of its 40-ft. boom. The crane is moved by a reciprocating steam engine in the usual way, and the swinging and elevation of the boom are taken care of in a similar manner.

The small generator set, which is entirely independent of the other operating mechanism, is mounted, as illustrated, in a compartment beneath the floor of the operator's cab, where it is entirely out of the way. It is stated that full power can be obtained in less than 1 min., and aside from an occasional oiling the turbine requires no attention. Care is taken to secure accurate balancing of the rotating parts to eliminate vibration, so that a small, light and inexpensive base, bolted rigidly to the crane, suffices. The whole set is located in a pocket or shelf, as indicated, entirely out of the way, but it is accessible by means of a large door to the compartment.

Adding Vanadium to Muck Iron.—A patent (1,079,129) has been granted to John Kirby, Pittsburgh, on a process for introducing vanadium into muck bar to increase its tensile strength. A composition containing vanadium oxide with a reducing agent and an agent to increase the combustion of the reducing agent, so as to reduce the vanadium and thoroughly incorporate it in the iron, is fed into a heat of muck iron in a puddling furnace about the time the cinder is boiled off and before the iron is ready to ball. The composition may contain vanadium oxide, 32 parts; aluminum, 8 to 16 parts; iron rust, 8 parts; potassium chlorate, 2 parts; black oxide of manganese, 1 part and barium dioxide, 1 part.

Steam Generator for Gas Producers

Construction and Operation of a German Device Which Is Economical and Convenient

Many gas producer plants have labored under one great disadvantage: If they used steam they were dependent in many cases on a boiler plant situated at a considerable distance from the producers. Under such circumstances not only was considerable expense incurred in unnecessarily firing the boilers when the rest of the shop was idle, but there was heavy loss from condensation in conducting steam a long distance. Georg Hannack, in *Stahl und Eisen* for October 16, describes an apparatus put on the market by Bender and Främb, of Hagen, in Westphalia, which has found quite an extended use in iron, steel, zinc and other metallurgical works in Germany.

The plan of the apparatus is shown in Figs. 1 and 2. A small amount of gas from the producers is tapped from the gas main at *d* and burned in the combustion cham-

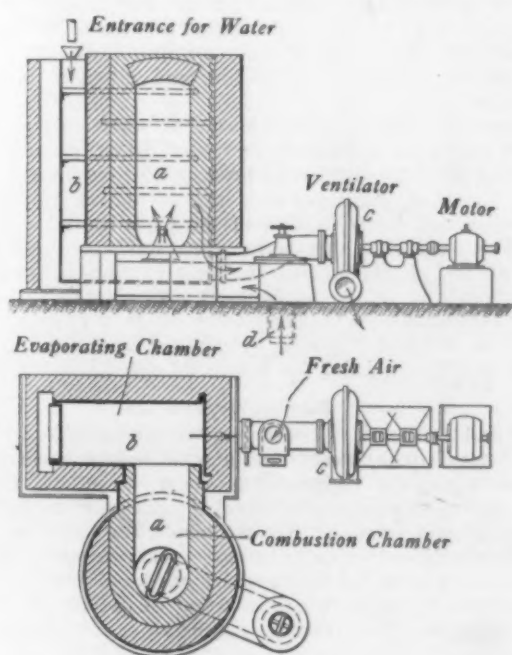


Fig. 1—Vertical Section of Apparatus
Fig. 2—Horizontal Section of Apparatus

ber *a*. The hot gases are drawn through the evaporating chamber *b*, located near by, in which they vaporize and convert into steam as much water as is necessary for the operation and production of a good gas. The ventilator *c* (of 3 to 4 hp. for a 10-ton producer) forces into the gas producer the mixture of the products of combustion with the steam and the air, whose temperature is about 150 to 170 deg. C., and whose carbon dioxide content is about 1 to 1.50 per cent. It is evident that a mixture heated as highly as possible prevents any condensation in the steam, so that actually only the least amount of steam necessary for the operation of the producer need be formed. A temperature of over 100 deg. C. prevents the formation of sulphurous acid and consequently the corrosion of the pipes. In using saturated steam it is figured that 1 kg. of gasified coal requires from 0.4 to 0.5 kg. of steam, while a temperature of the mix-

ture of 150 to 170 deg. C. reduces the necessary steam to 0.25 to 0.30 kg. without the formation of large lumps of slag. But the presence of small, brittle lumps of slag insures a quiet, even operation of the producers which makes itself manifest in a reduced coal consumption, even though a part of the saving in coal is neutralized in drawing off some of the producer gas for the evaporator. An important factor in the operation of gas producers with this evaporator is an isolation of the pipes. It would be well also to isolate the combustion and evaporation chambers by surrounding each with a thin brick wall and thus protect them from loss of heat on all sides.

In the table are shown some figures collected during a five months' operation of a 10-ton gas producer with a vaporizer. They show that a gas producer plant can be very profitably operated with its own vaporizing or steam producing apparatus. The advantages consist in the following: Independence from a boiler plant—a saving in wages as well as coal for the boilers; a regular and uniform operation of the producers with greater certainty of uninterrupted, and continuously good gas.

Naturally, total values depend on location and on industrial conditions; but there is no doubt that the combination of a gas producer with a vaporizing apparatus is a step in advance in the technique of gas producing which will appear the more essential the more the relations between gas producer and vaporizing apparatus are studied.

Annealing Steel in a Tunnel Oven

An interesting experiment in annealing has been performed, according to the *London Times*, by the Dressler Tunnel Ovens Company, Ltd., London, England. The apparatus so far has been used mainly for pottery purposes but it was used recently in a trial attempt at annealing steel in a tunnel oven installed at the works of J. H. Barratt & Co., Stoke-on-Trent.

Two kinds of castings were placed on a truck which was moved slowly toward the combustion area, their temperature uniformly rising to 1000 deg. C. and then falling gradually as they passed away from the hottest zone. The journey through the oven occupied 27 hr. and at the end of it the castings were notched and broken so that the effects of the treatment on the structure of the metal might be judged. One of the steels employed contained carbon 0.10 per cent., silicon 0.17, manganese 0.19, sulphur 0.020, and phosphorus 0.052, and while before treatment its resistance to shock stresses, as determined by a notched one-blow impact test, was 11 ft.-lb. and 5 ft.-lb.; after treatment it was 46 ft.-lb. and 50 ft.-lb., while its coarse crystalline structure was found to be satisfactorily refined. The second steel was an alloy steel characterized by very large crystalline structure when cast, and it also was completely refined. There is reason to believe the time could be shortened to 10 or 12 hr. It is suggested that the tunnel might also find application in the annealing of bar steel, drawn tubes, cold rolled strips, wire coils, and other products in connection with which it is of prime importance that the atmosphere should produce no scale or even tarnish the bright surface of the goods.

A metallurgical and mining section of the Engineers' Society of Western Pennsylvania has been organized, the membership consisting chiefly of the metallurgists of the steel mills and allied industries in the Pittsburgh district and of mining engineers of the surrounding coal mining districts.

Table Showing Results of Five Months' Operation of New Apparatus

Temperature in deg. C.

Conditions of operating	Composition of generator gases				Approximate heat value in heat units	CO ₂ content of the gases from the vaporizer in per cent	Amount of water vaporized, cfm	Of the product of combustion + steam	Of the fresh air admitted	Of the mixture before its entrance into the producers	Production in 24 hours, tons
	CO ₂ per cent	CO per cent	CH ₄ per cent	H per cent							
1. Without the vaporizer, but with a Körting blower.....	4.9	25.2	2.5	11.4	1335.5	..	3.80	..	..	..	9.5
2. With the vaporizer and with the admission of cold fresh air	4.2	27.0	2.3	12.1	1391.5	1.3	2.70	290	15	165	9.0
3. With the vaporizer and pre-heated fresh air.....	4.0	27.2	2.4	14.1	1467.0	1.3	2.61	290	100	250	8.7
4. With the vaporizer and pre-heated air, but diminished quantity of water.....	3.8	28.1	2.6	12.3	1459.0	1.4	2.10	300	110	270	8.4

Trade Publications

Open-Hearth Sheets.—Apollo Steel Company, Apollo, Pa. Booklet. Devoted to the Apollo brand of Bessemer black and galvanized steel sheets. Full information regarding the sizes and gauges of the sheets made is included.

Oil and Gasoline Storage Outfits.—Tokheim Mfg. Company, Cedar Rapids, Iowa. Collection of bulletins. Relate to a line of oil and gasoline storage and pumping outfits and apparatus for garages, factories, etc. The tanks are constructed of galvanized tank steel and are fitted with a fill pipe designed to prevent explosion. The parts of one of the self-measuring pumps mentioned are constructed to admit of especially quick access for repair. A gallon meter is furnished as part of the equipment. An installation of pumps on several floors of a factory with storage tanks under ground is illustrated. Battery outfits for lubricating and other oils in combination designed for factories and large garages are featured. Among this special equipment mentioned is a gasoline filter, hose, nozzles, etc. Attention is called to the Underwriters' label, placed on the company's products.

Steam Turbines and Generators.—Allis-Chalmers Mfg. Company, Milwaukee, Wis. Bulletin 1084, superseding bulletin 1079. Illustrates and describes the standard horizontal Parsons or reaction type of Allis-Chalmers turbo-generating sets, built in sizes from 300 kw. up. The turbines are furnished in the high-pressure condensing, the high-pressure non-condensing and low or mixed pressure condensing styles. Among the advantages claimed for the company's system of blading is that the blades are firmly attached and that the spacing and angles of the blades are accurate and that each blade is individually formed by special machine tools. Attention is called to the ventilating provision made for the generator and the unusually low power required for the excitation of the alternating current turbo-generator. Among several installations illustrated, one is at the Cambria Steel Company, Johnstown, Pa.

Punching and Shearing Machine.—Clark Foundry Company, Rumford, Maine. Folder. Relates to the company's No. 2 power machine, which is fitted with a removable and interchangeable punch and die holder or yoke. It is claimed that but 10 sec. is required to change form one size or shape of punch to another. The angle trimming attachment takes the regular yoke seat, and is used for trimming angles after they have been cut square on the angle cutter and for shearing and trimming plates up to $\frac{1}{2}$ in. thick. The company's hand machine is also illustrated. A partial list of purchasers is included.

Vertical Boring Mills.—Gisholt Machine Company, Madison, Wis. Illustrated circular. Relates to the use of vertical boring mills in electrical plants and locomotive shops. Views are given of these machines in use; one view showing a battery of four 42-in. mills finishing motor housings and bonnets, where an accuracy of 0.001 in. is required. Two views are given of 52-in. mills in railroad shops, one boring a tire and the other a journal. Mention is also made of the boring of air pump cylinders with this machine where the time required has been reduced from 95 to 16 min.

Ball Bearings.—Hess-Bright Mfg. Company, Philadelphia, Pa. Pamphlet. Contains a brief discussion concerning ball bearings and their application to axle generators for train lighting with particular reference to this company's product. The construction of the bearings is briefly described and there are a number of the views showing them applied to the armatures on train lighting generators.

Iron Cement.—Smooth-On Mfg. Company, 572 Communipaw avenue, Jersey City, N. J. Folder. Shows a few of the ways in which the company's iron cement No. 7 has been used for waterproofing and stopping leaks in concrete. These include repairs to cellar sidewalls, cracks in concrete oil storage tanks, etc.

Elevating Trucks.—Cowan Truck Company, Holyoke, Mass. Catalogue. Shows these trucks in use in a number of industrial plants for handling a wide variety of material and includes a number of testimonial letters. The different types of trucks are also illustrated and condensed specification tables are given. An illustration of the various replacement parts, numbered to correspond with a list for ready reference is given, together with data on the reduction in cost made possible by the use of these trucks.

Clam Shell and Orange Peel Buckets.—McMyler-Interstate Company, Cleveland, Ohio. Bulletin No. 29. Describes and illustrates a line of clam shell and orange peel buckets, including different types of two, three and four line clam shell buckets and extra heavy standard multi-power, rope reeved and three-sided orange peel buckets, with tables of sizes and dimensions. Standard gauge locomotive cranes equipped with the company's bucket for handling sand, gravel, coal and ore are shown, as well as other types of locomotive cranes. A steam clam shell bucket, which can also be operated by compressed air and various types of material handling tubs are also covered.

Air Compressors.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 34-D. Illustrates and describes a line of steam-driven Corliss air compressors for use where large volumes of compressed air are required. The advantages of using one

or more large machines instead of a number of smaller units are pointed out, and this is followed by a complete description of the construction and mechanical details of the compressors, the text being supplemented by numerous line and halftone engravings. Tables of dimensions are given, together with views of the compressors in use in a number of plants. Views are also given of the various other types built by this company.

Concrete Machinery.—Bragstad Concrete Machinery Company, Canton, S. Dak. Treats of machinery for making reinforced concrete blocks and shows a number of structures that have been erected with this type of building material. The advantage claimed for the use of reinforced concrete blocks is that the cracks that frequently have been found in concrete structures are eliminated.

Crucible Steel.—Braeburn Steel Company, Braeburn, Pa. Cloth bound catalogue. Size, $5\frac{1}{4} \times 7\frac{3}{4}$ in.; 57 pages. Illustrates a large line of crucible carbon steel castings and forgings. Attention is called to the several standard grades of crucible alloy steels for special uses and to annealed steel. Directions for using the various grades to best advantage are given. Several pages of generally useful rules and tables are included in the booklet.

Heat Treatment.—Peerless Motor Car Company, Cleveland, Ohio. Illustrated booklet. Size, $4\frac{1}{4} \times 6\frac{1}{2}$ in.; 14 pages. Relates to the special heat treatment and metallurgical attention given the steel entering into the construction of the company's motor cars. Not only is all the steel analyzed as received, but research work is constantly under way. It is claimed that in scope and accomplishment the work along heat treatment lines excels the laboratories of any steel mill or university. The necessity for special treatment to obtain steels adapted for various uses is discussed. The company finds it necessary to use as many as four separate heat treatments for one piece of steel. Laboratories and processes of heat treatment are well illustrated.

Steam Apparatus.—Consolidated Mfg. & Supply Company, 610 Manufacturers Building, Pittsburgh, Pa. Pamphlet and Engineer's bulletin, No. 120. The double valve of the steam trap illustrated in the pamphlet is claimed to afford a greatly increased capacity over other types. The trap has but four working parts. Among other features, attention is called to the installation of this trap above the water line, thus making for accessibility and freedom from mud and scale. Cross-sections and the method of installation are shown. The steam separator illustrated in bulletin No. 120 is of steel shell construction and is furnished in both vertical and horizontal types, and made for any capacity or pressure desired. The construction of the baffle is claimed to be such that the pressure reduction is a minimum, and that all the foreign material is separated from the live steam. Horizontal and vertical receiver separators, oil separators and a whistle alarm discharge tank are illustrated. A list of separator users and results of tests are included.

Grab Bucket and Converter.—Whiting Foundry Equipment Company, Harvey, Ill. Catalogues Nos. 104 and 106. The first describes and illustrates the Waters quick detachable grab bucket, designed for cleaning up foundry floors, cutting and cooling sand, filling large molds, or conveying coal in power stations and other use where crane service is available. A special feature claimed for the grab bucket is that it is instantly detachable from the crane. Among the advantages mentioned, emphasis is placed upon the fact that the blades can be readily released from any position, even if an obstruction should be placed between them. Directions for operation and photographs of typical installations are given. The side-blow steel converter treated in catalogue No. 106 is furnished in 1 and 2-ton sizes. Much general steel process information is given as well as a plan and list of equipment necessary for a complete plant. Whiting converter installations, such as at the Oliver Chilled Plow Company, South Bend, Ind., are illustrated.

Turbine Pumps.—Platt Iron Works Company, Dayton, Ohio. Bulletin No. 755. Pertains to a line of high lift and turbine pumps for high head, waterworks, boiler feed, mine and similar services. It shows a few standard designs which are built for all heads and service conditions up to 700 ft., and are arranged for direct connection to electric motors, steam turbines, steam or gas engines, or for belt drive, as may be desired. The general construction and principle of operation are briefly touched upon, followed by the results of tests and directions for installing and operating. A table of general dimensions with two sets of elevation drawings is included.

Spiral Riveted Pipe.—American Spiral Pipe Works, P. O. Box 485, Chicago, Ill. Catalogue No. 5, fourth edition. Size, $8 \times 10\frac{1}{4}$ in.; 80 pages. The pipe is made from sheet steel, wound into helical shape, and is cold riveted by compression or squeezing. It is made in a continuous piece and cut off to any length. Hydraulic tests are claimed to prove that the seams are the strongest part of the pipe. Attention is called to a special forged steel flange claimed to obviate the expensive breakage experienced with cast-iron flanges to galvanized pipe for refrigerating plants and other pipe and pipe fittings. A large part of the catalogue is given up to illustrated descriptions of a number of installations. Several pages of generally interesting information, including tables in regard to hydraulics, are given.

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